Thomas R. Teehan
Senior Counsel

March 4, 2013

VIA HAND DELIVERY & ELECTRONIC MAIL

Luly E. Massaro, Commission Clerk
Rhode Island Public Utilities Commission
89 Jefferson Boulevard
Warwick, RI 02888

RE: Docket 4382 - National Grid's Proposed FY 2014 Electric Infrastructure, Safety, and Reliability ("ISR") Plan
Response to Commission Data Request 1-1

Dear Ms. Massaro:

On behalf of National Grid[1], I have enclosed ten (10) copies of a bound version containing the Company's responses to the Rhode Island Division of Public Utilities and Carriers' data requests issued as part of its review of National Grid's FY 2014 Electric ISR Proposal.

This bound version responds to Commission Data Request 1-1 issued on February 18, 2013.

Thank you for your attention to this transmittal. If you have any questions, please feel free to contact me at (401) 784-7667.

Very truly yours,

Thomas R. Teehan

Enclosures

cc: Docket 4382 Service List
Leo Wold, Esq.
Steve Scialabba, Division

[1] The Narragansett Electric Company d/b/a National Grid (hereinafter referred to as "National Grid" or the "Company").

National Grid

The Narragansett Electric Company

Electric Infrastructure, Safety, and Reliability Plan FY 2014 Proposal

Copy of Responses to Division Data Requests

March 4, 2013

Docket No. 4382

Submitted to:
Rhode Island Public Utilities Commission

Submitted by:

nationalgrid

Division – Set 1

Division 1-1 (Electric)
Asset Condition

Request:

Provide information on URD cable replacements in EUA areas – when did these areas transition to conduit based designs.

Response:

A cable in conduit based design, rather than direct buried cable design, was adopted by EUA prior to the acquisition by National Grid. It is believed that the transition to conduit-based designs began in the mid-1980's.

Prepared by or under the supervision of: Jennifer Grimsley

Division 1-2 (Electric)
Asset Condition

Request:

Provide metal clad inspection and diagnostic procedures.

Response:

Please see the following attachments:

Attachment DIV 1-2a (Asset Condition): SMP 400.13.2 Visual and Operational (V&O) Inspection Procedure (General Substation).

Attachment DIV 1-2b (Asset Condition): SMP 417.02.2 Metalclad Bus, Switchgear, and Substation (V&O and Diagnostic Inspections)

Attachment DIV 1-2c (Asset Condition): SMS 417.01.1 Substation Bus (V&O Maintenance Standard on outdoor open air bus and metalclad).

Prepared by or under the supervision of: Jennifer Grimsley

INTRODUCTION

This procedure describes the methods used to perform Visual and Operational (V&O) Inspections of electrical substations used in the transmission and distribution of electricity.

PURPOSE

V&O Inspections, are performed with the apparatus in service, and are used to:

Verify the security of fences, gates etc. that prevent entry of the public, and provide a legal record of their inspection.

Detect any hazards to company employees or the public.

Verify that animal protection measures are present and in good condition.

Detect abnormal conditions before the apparatus is damaged or a customer outage occurs.

Collect data (counter readings, fault operations etc.) used to prioritize individual apparatus inspections.

Collect data (regulator travels, load readings, relay targets etc.) used for system operation purposes.

Not all equipment is listed in CMMS such as bus & line surge arrestors, distribution PTs/CTs, etc. which are considered consumables and found in stock. Any problems with such devices shall be noted in the mobile device under station general and supervision advised of these conditions.

ACCOUNTABILITY

Substation and other Supervisors supervising inspection and maintenance activities.

Substation and other Workers performing inspection and maintenance activities.

COORDINATION

Not Applicable.

REFERENCES

National Grid USA Safety Handbook

SMS 400.21.1 Oil Leak Reporting Procedure

SMS 400.15.1 Trouble Reporting Procedure

EP-14 Oil Filled Electrical Equipment Management

Manufacturer's Installation, Operating, and Maintenance manuals for the specific equipment to be inspected.

Manufacturer's operating manuals for the specific test equipment to be used.

DEFINITIONS

CMMS - Computerized Maintenance Management System

TRAINING

Not Applicable.

DOCUMENT CONTENTS

Table of Contents

1.0 TEST EQUIPMENT REQUIRED

1.1 Digital Multi-meter, IEC 1010-1 Cat. IV

1.1.1 Spare battery

1.2 Recloser Battery test meter with load test feature.

1.2.1 For Form 3 Recloser battery tests.

1.3 AB Chance Digital Phasor

1.3.1 For testing Delta Bus grounds

2.0 MATERIALS REQUIRED

2.1 Mobile Device with National Grid V&O software installed.

2.2 Clipboard

2.3 Binoculars

2.4 Flashlight

2.5 Magnet for resetting drag hands

2.6 Additional items listed in Appendix A

3.0 INITIAL SUBSTATION ENTRY

3.1 Personal Protective Equipment

3.1.1 Minimum requirement is ANSI Z41/EH rated safety footwear, hard hat and safety glasses.

3.2 Vehicles entering substation

3.2.1 Lower and/or insure antennas will maintain minimum approach distances to energized conductors and apparatus.

3.2.2 Use extreme caution when maneuvering to avoid hitting apparatus or violating Minimum Approach Distances.

4.0 INSPECT YARD

4.1 Perform a quick initial inspection for:

4.1.1 Alarms.

4.1.2 Cut or removed ground grid or ground grid connections.

4.1.3 Obvious damage.

4.1.4 Security of gates, fence and locks.

4.1.5 Unusual noises.

5.0 NOTIFY THE SYSTEM OPERATOR

5.1 Inform them you are in the Station for a V&O Inspection and that you will be testing alarms.

5.2 Ask System Operator if any equipment has been tagged out or relays blocked.

6.0 REPORTING AND CORRECTING PROBLEMS AND DISCREPANCIES

6.1 Severe Trouble shall be reported to the responsible Control Center and the person in charge of the substation immediately.

6.1.1 The employee shall secure the area and warn unauthorized people to stay clear of the danger.

6.1.2 A severe trouble condition is a situation that is hazardous to the system operation and/or National Grid employees or the public.

a. See Trouble Reporting Appendix at the end of this document for additional information on trouble reporting.

6.2 See the section Oil Leak Reporting for information on reporting oil leaks.

6.3 Document all paint and preservation problems.

6.3.1 Rust, corrosion, or fading to the point where primer, or bare metal shows.

6.4 Problems and discrepancies found should be repaired during the V&O Inspection whenever possible.

6.5 Problems and discrepancies not corrected during the V&O Inspection shall be recorded on the Mobile Device as a note in all cases (Station V&O Inspections).

6.5.1 Must inform Supervisor of noted problems.

6.5.2 The Supervisor reviewing the inspection shall generate follow-up work orders to document the required work.

6.6 Record findings in the Mobile Device

6.6.1 Record other readings or problems as Notes in the Mobile Device

6.6.2 If performing an apparatus inspection record the V&O Inspection portion in the V&O section of the Inspection Card.

7.0 CONTROL HOUSE

7.1 Check control house door locks working and in good condition.

7.2 Station Log Book

7.2.1 Enter the date, time and employee names that are performing the V&O Inspection.

7.2.2 Check the Station Log Book for abnormal conditions that can be corrected during the V&O Inspection.

a. After the V&O Inspection, record all abnormal problems found in the Log Book, with red pen, and whether they were corrected or not.

7.3 SPCC - SPCC locations only.

7.3.1 Verify SPCC Plan is available at the substation.

7.3.2 Verify SPCC notification list posted.

7.3.3 Check oil spill containment kits complete and in good condition.

7.4 Control Panels

7.4.1 Indicating Lights

a. Check that the indicating lights on the control board are working.

b. Check the available stock of spare bulbs; restock as necessary.

c. Inspect rear of Control boards for any signs of overheating, burned wiring, moisture, etc.

7.5 Noises - Listen for any unusual noises from relays, modules, RAPRs, timer circuits etc.

7.6 Relay targets and alarms.

7.6.1 Record targets and alarms on the V&O Report and in the station log book.

a. List the apparatus affected indicating circuit designation, phase and type of relay or alarm,

7.6.2 Reset and report relay targets and alarms to the System Operator and your supervisor.

7.7 Reclosing Relays

7.7.1 Check that reclosing relays are in service.

a. Record any reclosing relays that are off and tagged.

b. Report any reclosing relays that are off and not tagged to the System Operator.

7.7.2 Verify mechanical reclosing relays are in the start or zero position.

7.8 Ground Trip Switches (cutouts)

7.8.1 Check that all ground trip relays are in service (ON).

a. Record any ground trip switches that are off and tagged.

b. Report any ground trip switches that are off and not tagged to the System Operator.

7.9 Bus Transfer Schemes

7.9.1 Check both buses alive (load ammeters, bus voltmeters bus alive lights).

7.9.2 Check timers reset

7.9.3 Check that the sequence timers in normal position

7.9.4 Check transfer scheme auto

a. Record any auto transfer switches that are manual or off and tagged.

b. Report any auto transfer switches that are manual or off and not tagged to the System Operator.

7.9.5 Check tie breakers properly setup (setup varies by station scheme).

7.10 High Side Transfer Schemes

7.10.1 Check both lines alive (load ammeters, line alive lights).

7.10.2 Check timers reset

7.10.3 Check that the sequence timers in normal position

7.10.4 Check transfer scheme auto

a. Record any auto transfer switches that are manual or off, and tagged.

b. Report any auto transfer switches that are manual or off, and not tagged to the System Operator.

7.10.5 Check air break/circuit breaker/circuit switcher status (open or closed).

7.11 Annunciator and Alarm Test Switches

7.11.1 Annunciator panel

a. Move toggle switches, that are not tagged, to the TEST position to check lights. This will send an alarm to the Control Center.

b. To clear trouble condition, turn the toggle switch to the reset position, then back to ON.

c. Check with supervisor before testing any switches that are in the off position.

d. Verify the System Operator received the alarms.

7.11.2 Test Switches

a. If the alarm light is on perform steps b) through f).

b. Verify the System Operator received the alarm.

c. Open knife blades one by one and leave open until the light goes out and the alarm clears.

d. Close the knife switches opened one at a time, checking for alarm indications.

e. When the alarm light comes on reopen the last switch closed and continue closing the rest. This will find multiple alarms, if present.

f. Operating the knife switches does not reset this type of alarm system. The light only stays out when the trouble condition has cleared.

7.11.3 Repair of alarm conditions.

a. Alarm conditions should be corrected during the V&O Inspection.

b. If the alarm condition can not be corrected during the V&O:

1. The alarm should be cleared by opening the test twitch or turning the annunciator switch to OFF.

2. The switch should be tagged with the date, reason and inspectors name.

3. Both the System Operator and your supervisor should be notified that the alarm condition exists and the alarm point is off.

7.12 Radio Alarms

7.12.1 Inspect condition of radio system for damage, and proper operation.

7.12.2 If individual alarms have not been sent to the System Operator send a test alarm to from the radio cabinet.

a. Verify the System Operator received the alarm.

7.12.3 Make sure cabinet door is closed so the receiver voice communication is disabled.

7.13 Tags and Clearance and Control switching forms and Supplies

7.13.1 Check the stock of Clearance and Control Tags.

a. Restock as necessary.

7.13.2 Check the stock of Ground Device Identification Tickets (GDIT).

a. Restock as necessary.

7.13.3 Check the stock of Filed Switching Order Pads

a. Restock as necessary.

7.13.4 Check that pens (red and blue/black) and pencils are available.

a. Restock as necessary.

7.14 Control House Heating and Lighting

7.14.1 Test control house lighting.

a. Replace any defective bulbs, or ballasts or sockets.

7.14.2 Test emergency lighting.

a. Replace batteries if needed

7.14.3 Inspect heaters, fans and thermostats for proper operation. Make sure fans are not broken or bound up and they are in good working order.

7.15 Station Service and Transfer Switch

7.15.1 Check transfer switch on preferred supply

7.15.2 Check transfer switch for damage or overheating.

7.15.3 Test and record preferred and alternate secondary voltages at transfer panel.

7.16 Check AC supply panels for:

7.16.1 Tripped circuit breakers.

7.16.2 Circuit breakers in the proper position.

7.17 Check DC Circuit Breaker of Fuse Panel

7.17.1 Check DC supply panels for:

a. Tripped circuit breakers or blown fuses.

b. Circuit breakers in the proper position.

7.18 Protective Grounds

7.18.1 Check that grounds in station are in sets of 3 and that they are hung up properly.

7.18.2 Check that the phase end and ground clamps are in good working order.

7.18.3 Lubricate as required.

7.18.4 Inspect for the cracked or cut insulation and broken conductor strands.

7.18.5 Replace or repair damaged protective grounds. Do not leave damaged grounds at the station.

7.19 Switch Sticks

7.19.1 Inspect Switch Sticks and Grounding Sticks for current dielectric test date.

a. Send out of date sticks to lab for testing or;

b. Test locally using approved methods, test equipment and competent, trained personnel.

7.19.2 Inspect Switch Sticks and Grounding Sticks for surface contamination, damage and proper operation.

a. Clean if necessary

7.19.3 Insure Switching and Grounding Sticks are stored properly.

7.20 Fire Equipment

7.20.1 Inspect fire extinguishers to be properly secured and in their marked locations.

7.20.2 Update inspection cards.

7.20.3 Record out of date fire extinguishers on the V&O and record for future replacement.

7.20.4 Discharged fire extinguishers shall be reported to the appropriate supervisor for recharging.

7.20.5 Discharged or partially discharged fire extinguisher shall be removed from the substation.

7.21 Phone Lists

7.21.1 Verify local and regional System Operator phone numbers are posted and correct.

7.21.2 Verify that the emergency telephone list is posted and clearly visible at each telephone location.

7.22 Cleanliness and General Condition

7.22.1 Clean control house floors and sanitary facilities, empty wastebaskets and dust as necessary.

7.22.2 Inspect control house for water leaks.

7.22.3 Check for signs of animal entry into control house.

7.23 Turn on yard lights, so they can be checked during the Yard Inspection.

8.0 YARD INSPECTION

8.1 Unusual Noises

8.1.1 Be alert for arcing, gurgling and pinging noises which could indicate imminent and violent equipment failure.

8.2 Walk the fence and inspect:

8.2.1 Barbed wire - Strands to be intact and tight.

8.2.2 Fence fabric - Holes or breaks in the chain link.

8.2.3 Fence Ties - Loose or missing fence tie wires.

8.2.4 Fence Erosion - Signs of erosion or digging under the fence.

a. Space below fence should be less than 3 inches.

8.2.5 Grounding - For all newly constructed or additions/modifications to existing substations, ground conductor and connections secure and connected at every other fence post. Posts on both sides of gates should be grounded.

8.2.6 Fence Posts - Sound, not rusted through at ground level and not been raised by frost.

8.2.7 Check that there are no available climbing opportunities that would assist access both internal and external to the substation fence within 10 feet.

8.3 Gates

8.3.1 Test gates for proper operation.

a. Gates should swing easily out of the way.

8.3.2 When closed, the gates should by chained tightly, or locked, with minimal space.

8.3.3 Verify locking chains, hardware and locks present and in good condition.

8.3.4 Grounding - For all newly constructed or additions/modifications to existing substations, ground conductor and connections secure and connected at every other fence post. Posts on both sides of gates should be grounded.

8.4 Check for proper "Danger High Voltage" warning signs:

8.4.1 Every 50 feet along perimeter of fence.

8.4.2 On gates and on non-hinged side of gate. (see National Grid Standard #0105)

8.5 Substation yard security problems shall be corrected or reported immediately to supervisor.

8.6 Vandalism related problems should be specifically recorded as such, and reported to supervisor.

8.7 Yard Lights

8.7.1 Check all yard lights working. (Yard lights should have been turned on during control house inspection.)

8.7.2 Repair broken bulbs, glass fixtures, spot light heads, or other lighting that needs attention.

a. If work cannot be completed safely and while maintaining safe work clearances or if special equipment such as a bucket truck is needed, note on the V&O report.

8.8 Vegetation

8.8.1 Check for any growth of trees or vegetation in fence and gate areas that animals or people could used to climb over the fence.

a. Cut or record for the Arborist to have removed.

8.8.2 Record vegetation growth within the substation that requires spraying or removal.

8.9 Bus and structure.

8.9.1 On Delta Buses (2400 V & 4800 V) shall be checked for grounds and noted in the mobile device.

8.9.2 Record missing or damaged animal protection devices.

8.9.3 Inspect insulators for:

a. Broken, chipped or damaged skirts.

b. Carbon tracking or flash over.

c. Surface contamination (dirt, rust, salt spray etc.).

d. Broken or damaged insulators should be recorded on V&O Report.

8.9.4 Broken porcelain should be picked up off the ground.

8.9.5 Visually inspect current and voltage transformers for damage or signs of overheating.

8.9.6 Visually inspect arresters for:

a. Blown or damaged arresters

b. Surface contamination

8.9.7 Visually inspect potheads and cable terminators for:

a. Damage and leaking compound.

b. Surface contamination

8.9.8 Report unusual noises immediately and record them on the V&O Report.

8.10 Structure and apparatus ground connections

8.10.1 Inspect for any cut, broken or missing ground connections to apparatus, structures and guy wires.

8.10.2 Inspect static wires and record any problems.

8.10.3 Visually Inspect Station Service Transformers for:

a. Evidence of oil leaks on transformer tank, and on the ground.

b. Bushing damage or surface contamination.

c. Damaged or improperly closed primary fuses.

d. Output Voltage if not previously measured at station service transfer switch.

8.11 Inspect equipment and structure foundations.

8.11.1 Large cracks.

8.11.2 Settling (not level).

8.11.3 Deterioration (large areas of surface erosion, stone showing).

8.12 Inspect Cableways

8.13 Damage, missing or broken cover sections and deterioration.

8.14 Inspect buildings junction boxes, structures etc. for overall paint condition

8.14.1 Record items needing attention.

8.15 Clean up substation yard.

8.15.1 Remove broken porcelain, debris, and trash

8.15.2 If area requires major clean up or crushed stone requires leveling, note on V&O Report.

8.15.3 If equipment or materials are intentionally stored in the yard insure that they are neatly placed and not a hazard to personal. Barricade area if necessary.

a. Storage should be in compliance with SMS 499.10.1 Substation Work Area Identification Procedure.

9.0 OIL LEAK REPORTING

9.1 Oil filled apparatus must be inspected for any signs of leaks.

9.1.1 The oil leak status shall be recorded for each piece of oil filled apparatus that has an oil leak screen in the Mobile Device.

9.1.2 Leaks from small apparatus that do not have an oil leak screen in the Mobile Device should be recorded in a Mobile Device notes screen.

9.2 Oil Leak Status Codes

9.2.1 Oil leaks are categorized as follows:

a. Unknown - Unknown is used to indicate that no information has been entered in CMMS for this equipment.

b. Clean - Apparatus is dry and shows no evidence of oil leaks.

c. Repaired - A leak is found and repaired, note the repairs made.

d. Weep - Anytime the external surface of a piece of apparatus is wet with oil. Note the location and, if possible, cause of the leak.

e. Leak - Oil is running off or about to run off the external surface of containers or electrical apparatus. Required Action

9.3 Leaks categorized as Leak require immediate action to stop the leak or contain the released oil.

9.4 All leaks require creation of a Leak Report Work Order.

9.4.1 When the supervisor reviews the V&O inspection work order round screen all leak status changes and notes will show up as exceptions.

9.4.2 The Supervisor will then create a Leak Report Work order (Type LR) in Work Order Tracking or Quick Reporting.

9.5 Leaks from PCB Equipment

9.5.1 If a leak is discovered from equipment classified as over 500 ppm PCB cleanup must begin within 48 hours (40 CFR 761.30(a)(1)(x)).

9.5.2 The inspection records must also include:

a. The location of the leak;

b. The estimate of fluid released;

c. The date and description of any cleanup, containment, repair or replacement;

d. The results of any containment (for example, was containment successful or not).

e. The daily inspection results required for uncorrected, active leaks (refer to Environmental Procedure EP-14).

f. The records must be available for inspection by the EPA and must be maintained for at least three years after disposal of the equipment.

10.0 APPARATUS INSPECTIONS

Refer to the V&O Inspection sections of the following SMS's for apparatus inspections.

10.1 Circuit Breakers

10.1.1 SMP 401.01.2 - Air Magnetic Circuit Breaker Maintenance Procedure

10.1.2 SMP 401.02.2 - Oil Circuit Breaker Maintenance Procedure

10.1.3 SMP 401.03.2 - Vacuum Circuit Breaker Maintenance Procedure

10.1.4 SMP 401.04.2 - Air Blast Circuit Breaker Maintenance Procedure5

10.1.5 SMP 401.05.2 - Two Pressure Gas Circuit Breaker Maintenance Procedure

10.1.6 SMP 401.06.2 - Gas Puffer Circuit Breaker Maintenance Procedure

10.1.7 SMP 401.07.2 - Station Recloser Maintenance Procedure

10.1.8 SMP 401.08.2 - Vacuum Switch Maintenance Procedure

10.2 Transformers

10.2.1 SMP 402.01.2 - Power - 15 MVA and above Maintenance Procedure

10.2.2 SMP 402.02.2 - Power - Below 15 MVA Maintenance Procedure

10.2.3 SMP 402.03.2 - Dry Type Transformer Maintenance Procedure

10.3 Instrument Transformers

10.3.1 SMP 403.01.2 - Currents, Potentials and Metering Maintenance Procedure Voltage Regulators

10.3.2 SMP 404.01.2 - Step Voltage Regulator Maintenance Procedure

10.3.3 SMP 404.02.2 - Induction Voltage Regulator Procedure

10.4 Emergency Generators

10.4.1 SMP 405.01.2 - Emergency Generators Maintenance Procedure

10.5 Batteries & Chargers

10.5.1 SMP 406.01.2 - Lead/Acid Battery Maintenance Procedure

10.5.2 SMP 406.03.2 - Static Changers Maintenance Procedure

10.6 Sensing Devices

10.6.1 SMP 407.01.2 - Bushing Potential Device Maintenance Procedure

10.6.2 SMP 407.02.2 - Coupling Capacitors and CCVTs Maintenance Procedure

10.6.3 SMP 407.03.2 - Wave Trap Maintenance Procedure

10.6.4 SMP 407.04.2 - Resistive Coupled Potential Device Maintenance Procedure

10.7 Capacitors

10.7.1 SMP 408.01.2 - Station Capacitor below 69kV Maintenance Procedure

10.8 Disconnect Switches

10.8.1 SMP 409.01.2 - Disconnect Switches Maintenance Procedure

10.8.2 SMP 409.02.2 - Circuit Switchers Maintenance Procedure

10.8.3 SMP 409.03.2 - High Speed Grounding Switch Maintenance Procedure

10.8.4 SMP 409.04.2 - Gas Insulated Disconnect Switch Maintenance Procedure

10.8.5 SMP 409.05.2 - Gas Insulated Ground Switch Maintenance Procedure

10.9 Load Tap Changer

10.9.1 SMP 412.01.2 - Load Tap Changer Maintenance Procedure

10.10 Reactors

10.10.1 SMP 413.01.2 - Dry Type Reactor Maintenance Procedure

10.10.2 SMP 413.02.2 - Oil Filled Reactor Maintenance Standard

10.11 Metal Clad Bus and Switchgear

10.11.1 SMP 417.02.2 - Metal Clad Bus, Switchgear and Substation Maintenance Procedure

10.12 Surge Arresters

10.12.1 SMS 419.01.1 - Surge Arrester Standard (with arrester identification guide)

10.12.2 SMP 419.01.2 - Surge Arrester Maintenance Procedure

10.13 Network Protectors

10.13.1 NG-EOP UG022 - Network Transformer & Protector

<u>11.0 FINAL CHECKLIST</u>

11.1 Turnoff yard lights

11.2 Verify all abnormal conditions found are entered in station log book.

11.3 Call the System Operator and notify them that the V&O Inspection has been completed and you will be leaving the station.

11.3.1 Report any abnormal conditions, alarms or relay targets found.

11.4 Turn control house lights off and lock doors.

11.5 Re-arm security alarms.

11.6 Close and securely lock gate.

11.7 Turn in completed V&O Inspection Report to supervisor.

11.8 Connect Mobile Device to the network and sync the device to the CMMS .

12.0 APPENDIX A - ADDITIONAL MATERIALS

Not all of the listed items will be required in all areas. It is suggested that the items required for a particular area be stocked in the vehicle used for V&O Inspections or a large container that can be taken when inspections are to be done.

12.1 Cleaning Supplies

- 12.1.1 Broom and dust pan
- 12.1.2 Rags
- 12.1.3 Trash bags

12.2 Repair and Maintenance

- 12.2.1 Shovel
- 12.2.2 Ladder
- 12.2.3 Electrical tape
- 12.2.4 Small hand tools

12.3 Personal Protective Equipment

- 12.3.1 Acid resistant gloves
- 12.3.2 Face Shield and Apron

12.4 Station Supplies

- 12.4.1 Spare Station Log Books
- 12.4.2 System Operator (phone number) cards
- 12.4.3 Spare operations counter cards
- 12.4.4 Pen, pencils and erasers (red pencil for trouble)
- 12.4.5 Clearance and Control Tags
  - a. Red Tags
  - b. Non-Reclose Assurance (NRA) Tags
  - c. Hold Tags
  - d. Station Control (SCT) Tags
  - e. Worker Placards
- 12.4.6 Ground Device Identification Tickets (GDIT)
- 12.4.7 Clearance and Control Switching forms

12.5 Security Supplies

- 12.5.1 Spare Padlocks Locks:
  - a. Long shank 5105873

b. Short shank 5105872

12.5.2 Chain for gates

12.5.3 Fence tie wire

12.5.4 Fence fabric

12.5.5 Warning signs 0810029

12.6 Indicating Lamps and Lenses:

12.6.1 Switchboard LED (Red) S/C 5100183

12.6.2 Lens Cap (Red) S/C 5695322

12.6.3 Switchboard LED (Green) S/C 5100184

12.6.4 Lens Cap (Green) S/C 5695321

12.6.5 Switchboard LED (Amber & White) S/C 5100185

12.6.6 Lens Cap (Amber) S/C 5695320

12.6.7 Lens Cap (White) S/C 5100186

12.6.8 Switchboard Lamp 24EX S/C 5844590

12.6.9 Switchboard Lamp 145 Volt, 15W S/C 5841410

12.6.10 Indicating Bulb type 49 S/C 5843078

12.6.11 Indicating Bulb type 47 S/C 5843100

12.6.12 18 Volt Miniature 0.11A Automotive S/C 5843110

12.6.13 Indicating 35V, .06A S/C 5843132

12.6.14 Indicating type 43A S/C 5843250

12.6.15 Switchboard Lamp 24X S/C 5844610

12.6.16 Switchboard Lamp 55C S/C 5844630

12.6.17 Indicating Lamp 120 P.S.B. S/C 5841359

12.6.18 (for V.S.A. Reclosers)

12.7 Incandescent Lamps:

12.7.1 Incandescent Lamp 75 Watt S/C 5841739

12.7.2 Incandescent Lamp 100 Watt S/C 5841840

12.7.3 Incandescent Lamp 135 Watt S/C 5842001

12.7.4 Incandescent Lamp 200 Watt S/C 5842150

12.7.5 Mogul Base Lamp 500 Watt S/C 5842390

12.7.6 Flood Lamp PAR 38 100 Watt S/C 5842045

12.8 Fluorescent Lamps:

12.8.1 8 FT Single Pin Lamp 75 Watt S/C 5841050

12.8.2 4 FT Bi - Pin Lamp 40 Watt S/C 5840950

12.8.3 4 FT Single Pin Lamp 40 Watt S/C 5840940

12.8.4 8 FT Recessed Pin Lamp 105 Watt S/C 5841130

12.9 Spare emergency light batteries

12.10 Spare fuses

12.11 Recloser control and trip fuses

12.11.1 Reclosers often use time delay fuses that are similar in appearance to AGC types. If the wrong type fuse is installed it will blow after a couple of operations.

12.11.2 Cartridge fuses

a. 5A

b. 10A

c. 15A

d. 20A

e. 30 A

12.11.3 AGC Fuses

a. 2 A slow blow and instantaneous

b. 5A slow blow and instantaneous

c. 10A slow blow and instantaneous

d. 20A slow blow and instantaneous

12.12 Spare nitrogen bottles

12.13 Battery Supplies

12.13.1 5 Gallon distilled water and battery filler S/C 5599778

12.13.2 Battery NO SMOKING Signs S/C 5483448

12.13.3 Extra hydrometer S/C 5474448

12.13.4 Extra thermometer S/C 487304

12.13.5 Baking Soda

12.13.6 Spare eyewash bottles S/C 5890600

12.13.7 Nylon brush to clean battery posts

12.13.8 Battery grease

12.14 Spare recloser batteries

13.0 APPENDIX B – TROUBLE REPORTING

13.1 Trouble

13.1.1 The term trouble is defined as any condition which occurs on the equipment that has or could affect the ability of that equipment to perform its required function.

13.2 Severe Trouble

13.2.1 A severe trouble condition is a situation that is immediately hazardous to the system operation and/or personnel. These troubles are immediately reported to the System Operator and to the person in charge of the substation. The employee shall secure the area and warn unauthorized people to stay clear of the danger.

13.2.2 Examples of Severe Trouble

a. Dead station battery

b. Blown bushings or cable terminator

c. Downed live lines

d. Multiple broken support insulators

e. Electrical fires

f. Grounds cut in station

g. Loss of station service power

h. Broken pole or structure

i. Blown By-Pass/shunt arresters on regulators

j. Low oil levels

k. Unusually noises

13.3 Not Immediately Fixable Trouble

13.3.1 These troubles are reported to the System Operator and the person in charge of the substation. They shall also be noted on the V&O form and station logbook in red and scheduled for repair at a later date.

13.3.2 Examples of Not Immediately Fixable Trouble

a. Surge Arrester blown

b. Broken operating rods on disconnects

c. Damaged bus support insulators

13.4 Fixable Trouble

13.4.1 Fixable items should be repaired as they are discovered during the V&O Inspection. This insures that the station is maintained in the best possible operating condition and prevents unnecessary return trips. The items fixed should be noted on the V&O Report and in the station logbook.

13.4.2 Examples of Fixable Trouble

a. Low Battery electrolyte

b. Replacing blown lamps

c. Changing filters

d. Installing missing covers

e. Installing signs

f. Repairing holes in fence

g. Installing new locks

h. Cleaning and repairing oil leaks

i. Tightening compressor belts

j. Changing recloser batteries

k. Replacing control fuses

l. Changing nitrogen bottles

m. Changing Silica Gel turned pink or white

n. Cleaning and repairing leaks

14.0 REVISION HISTORY

Version	Date	Description of Revision
1.0	12/26/06	Initial version of document Corrected - Formmatting Changed - Header title, Document number prefix Removed - Subtitle Changed - First page footer to reference Documentum
1.1	02/22/02	Corrected - Formatting and grammar
1.2	04/06/07	Materials Required Removed – Infrared Thermometer Additional –Materials Changed – Switching Order pads to Clearance and Control switching forms Control House Changed – Switching Order/Markup Pads to Clearance and Control switching forms
1.3	05/23/07	Document Added - Documentum Version # to headers Added - File name to footer
1.4	07/02/07	Yard Inspection Moved – Be alert for unusual noises to beginning of section Added – Foundations Added – Cableways Apparatus Inspections Added – Metal Clad Bus, Switchgear and Substation Changed – SMS to SMP (33 places)
1.5	07/26/07	Control House Removed - Verify Check Lists Posted - New England only
1.6	08/20/07	Reporting Changed - Section name to Reporting and Correcting Problems and Discrepancies Revised 0 Section extensively revised Materials Required Removed - Substation V&O Inspection Report form, Report from last V&O Inspection, Substation V&O Checklist form
1.7	09/30/07	Switch Sticks Added - or; Test locally using approved methods, test equipment and competent, trained personnel.
2.0	08/31/12	Document Number - Changed "SMP 400.06.2" to "SMP 400.13.2" Originating Department - Changed from "Substation O&M Services" to "Substation Work Methods" Sponsor - Changed "Donald T. Angell" to "Susan Fleck" PURPOSE - Added 2nd paragraph COORDINATION - Added REFERNCES - Changed "SMS 400.13.1" to "SMS 400.21.1" and "SMS 400.08.1" to "SMS 400.15.1" DEFINITIONS - Added TRAINING - Added Section 1.3 - Added Section 2.1 - Changed "PDA with National …" to "Mobile Device with National …"

Section 6.5 - Changed "… shall be recorded on theInspection Card (Apparatus Inspections) or as a note in the PDA (Station V&O Inspections)." to "… shall be recorded on the Mobile Device as a note in all cases (Station V&O Inspections).'
Section 6.5.1 - Added and renumbered accordingly
Section 6.6 - Changed "Record findings in the PDA if listed in the PDA "round"" to "Record findings in the Mobile Device"
Section 6.6.1 - Changed "…as Notes in the PDA" to "…as Notes in the Mobile Device"
Section 8.2.5 - Replaced
Section 8.2.7 - Added
Section 8.3.4 - Added
Section 8.9.1 - Added and renumbered accordingly
Section 9.1.1 - Changed "…leak screen in the PDA" to "…leak screen in the Mobile Device."
Section 9.1.2 - Changed "…screen in the PDA should be recorded in a PDA notes screen." to "…screen in the Mobile Device should be recorded in a Mobile Device notes screen."
Section 9.2.1.a - Changed "… been entered in AIMMS for this equipment." to "… been entered in CMMS for this equipment."
Section 10.13.1 - Replaced
Section 11.8 - Replaced

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INTRODUCTION

This procedure describes the methods used to perform Visual and Operational, and Diagnostic Inspections on metal-clad bus, metal-clad switchgear and metal-clad substations.

PURPOSE

Scheduled equipment inspections are necessary to protect both the public and electric utility workers, prevent unnecessary customer outages, and maximize equipment operating life. This procedure lists special tools and equipment required, unusual hazards, and methods used, to inspect metal-clad equipment.

ACCOUNTABILITY

Substation and other Supervisors supervising inspection and maintenance activities.

Substation and other Workers performing inspection and maintenance activities.

COORDINATION

New England - Worcester Lab – Thermographic Inspection

REFERENCES

National Grid USA Safety Handbook

SMP 401.20.2 - Circuit Breaker Profiler Testing

ANSI/IEEE C37.23 IEEE Guide for Metal Enclosed Bus….

Manufacturer's Installation, Operating, and Maintenance manuals for the specific equipment to be inspected.

Manufacturer's operating manuals for the specific test equipment to be used.

DEFINITIONS

Not Applicable

TRAINING

Not Applicable

DOCUMENT CONTENTS

Table of Contents

1.0 FACTORS AFFECTING METAL-CLAD UNIT RELIABILITY

1.1 Moisture and Water

1.1.1 Moisture and water contribute to most of the failures of metal-clad switch-gear, substations and busses.

1.1.2 Gaskets and caulking deteriorate over time allowing rain and melting snow to enter.

1.1.3 Condensation can occur especially if heaters and ventilation systems are not working correctly. Heaters in metal-clad units are normally on all of the time. Even in hot summer weather, they prevent or reduce condensation.

1.1.4 Water and moisture degrade insulation, cause rust and corrosion problems on mechanisms and moving parts, and can permanently degrade some types of insulators. Severe corrosion can result in more rain and melting snow entry and more severe problems.

1.2 High Temperatures

1.2.1 Metal –clad interiors can reach high temperatures in the summer even if ventilation systems are working correctly. High temperatures degrade the lubrication in breaker mechanisms and other moving parts, and can cause failure of electronic controls and relays.

1.2.2 It is important that ventilation systems are in good working order. Air conditioning may be required, or desirable, in some cases.

1.2.3 Breakers and other mechanical mechanisms will need more frequent lubrication, and are more sensitive to the use of correct lubricants and lubricating procedures.

1.2.4 Heat problems can be increased by dirty air filters in the ventilation system or cubicles.

1.3 Dirt and dust

1.3.1 Metal-clad units tend to collect more dirt and dust than outside equipment control cabinets. This can be due to the action of the ventilation system, and/or internal dust sources such as unsealed, or deteriorated, concrete floors.

1.3.2 Dirt and dust gets into lubrication, causing it to become gummy, causes abrasive wear and binding of mechanical mechanisms, and if severe enough traps and holds moisture and water. Cleanliness and control of dust/dirt sources is important.

1.4 Loss of hydrophobicity in insulators

1.4.1 Hydrophobicity is the property of materials to bead or repel water from their surfaces.

1.4.2 Glass fiber reinforced polyester resin insulators may permanently lose hydrophobicity if exposed to moisture for long periods of time. This loss will result in high leakage currents.

a. Glass fiber reinforced polyester resin insulators are commonly found in Techibus and may have been used by other manufactures.

1.4.3 Insulators with this problem will appear good if baked out, but will exhibit high leakages again within a matter of hours of exposure to ambient air.

1.4.4 The only solution to this problem is to replace the affected insulators, preferably with porcelain or cycloaliphatic epoxy units.

a. Porcelain and cycloaliphatic epoxy insulators do not have this problem.

2.0 TEST EQUIPMENT REQUIRED

2.1 V&O Inspection

2.1.1 Digital Multi-meter, IEC 1010-1 Cat. IV.

2.1.2 Spare batteries for multi-meter.

2.1.3 Low voltage clamp on ammeter probe for multi-meter or Clamp on ammeter probe capable of reading 1 to 30 amps.

2.2 Thermographic Inspection

2.2.1 Infrared test set. Lab supplies in NE.

2.3 Mechanism Inspection

2.3.1 Profiler test set. Kelman Profile P1 or P2.

a. Check for test leads and barcode reader.

b. Spare batteries for the profiler test set.

2.3.2 SMP 401.20.2 - Circuit Breaker Profiler Testing.

2.3.3 Test Traces and Limits Sheet for the breaker type to be tested.

2.3.4 Fused jumper lead (15 amp slow-blow) and spare fuse.

2.4 Diagnostic Inspection

2.4.1 All Above Plus:

2.4.2 AC or DC HI-Pot capable of 50 kV or Meg-ohmmeter - 5000V (AC HI-Pot is preferred).

a. 60 kV required for 38 kV. See table in Diagnostic section.

b. Check megger battery charged (if applicable).

c. Check AC power cable and test leads.

2.4.3 Contact Resistance Test Set - 100 Amp.

2.4.4 Digital Camera

a. Check batteries charged.

3.0 MATERIALS REQUIRED

3.1 V&O Inspection

3.1.1 PDA with National Grid V&O software installed.

3.1.2 Inspection data from last V&O inspection.

3.1.3 Binoculars.

3.1.4 Spare switchboard lamps.

3.2 Mechanism Inspection

3.2.1 Spare tags for profiler connection points.

3.2.2 District circuit breaker bar code book.

3.2.3 Breaker lubricants. See Appendix A.

3.3 Diagnostic Inspection

3.3.1 Spare tags for profiler connection points.

3.3.2 District circuit breaker bar code book.

3.3.3 Breaker lubricants. See Appendix A.

3.3.4 Inspection card/record from last diagnostic inspection.

4.0 UNUSUAL HAZARDS

In addition to the normal electrical hazards encountered in substations metal-clad units have other significant hazards.

Clearances from energized parts to ground are much less than in outdoor substations.

Bays are typically identical in construction and grounds may be difficult to see, or not possible to install. Use extra care and additional testing to be sure you know what is dead and what is alive. Make sure sufficient Work Area Identification is correctly installed.

Air magnetic circuit breakers may contain asbestos. They should not be blown out with compressed air; a portable HEPA vacuum should be used to remove dust etc. Dust, damaged arc chutes or broken pieces of arc chutes should be treated as asbestos waste (hazardous material) unless conclusively known otherwise.

When installing or removing, moving, or working on truck type breakers care shall be used to insure that the breaker, and breaker components, are stable and properly supported to avoid injury to workers. Particular care should be use on units with hinged arc chutes which may result in a high center of gravity and instability when folded up.

5.0 VISUAL AND OPERATIONAL INSPECTION

5.1 When doing the following V&O Inspections steps:

5.1.1 Class 2 rubber gloves are required when opening doors or removing covers on compartments containing energized components that are not insulated of guarded.

5.1.2 Do not open unhinged, bolted access covers unless specifically told to by your supervisor.

5.1.3 Do not break the plane of the door frame with any body part if the compartment contains primary voltages that are not fully guarded or insulated.

5.1.4 Do not attempt to clean any compartment that contains primary voltages that are not fully guarded or insulated.

5.2 Perform applicable sections of a normal Substation V&O) Inspection.

5.2.1 See SMP 400.06.2 and SMP 400.06.3.

5.3 Check ground grid/ground rod connections to metal clad.

5.4 Verify bus enclosure heaters working.

5.4.1 Bus and cubicle heaters are normally always on and should not be turned off.

5.4.2 Record current from clamp-on or installed ammeters.

5.4.3 If permanent ammeters are not installed it is recommended they be added.

5.5 Inspect cable entries for animal proofing

5.6 Inspect perimeter of metal clad (ground level) for possible animal entry points.

5.6.1 Record any found.

5.7 Inspect gasketed and sealed joints in switch gear, metal-clad substation and bus enclosure.

5.7.1 Inspect all that can be seen from ground level and do not require violating Minimum Approach Distances or otherwise compromising safety.

a. Record any problems found.

5.7.2 If any problems are found the station should be reviewed for the need of a complete Diagnostic Inspection.

5.8 Verify operation of ventilating fans and shutters, if installed.

5.9 Inspect building and compartment air filters, clean as required.

5.10 Verify operation of air conditioners, if installed.

5.11 Inspect metal-clad switchgear, substation and bus enclosure for corrosion and water or moisture damage.

5.11.1 Record any found.

5.12 Check indoor lights.

5.13 Listen for any indication of arcing or tracking within the switch gear, metal-clad substation or bus enclosure.

6.0 DIAGNOSTIC INSPECTION

6.1 Consideration should be give to modifying stations with know design problems that allow the entry of melting or driven snow, rain etc. while the station is out of service.

6.2 Perform first trip Profiler test on all breakers removed from service (switched out).

6.2.1 Refer to the appropriate circuit breaker type SMP and SMP 401.20.2 – Circuit Breaker Profiler Testing.

6.2.2 Record results.

a. Previously taken Profiler data may be used if less than 2 years old.

6.2.3 Close one feeder breaker (to provide load to capture main contacts) before opening low side transformer breaker. Request as part of switching order.

a. Reopen feeder breaker.

6.3 If not previously done take pictures of all roof bushings, vents or other roof penetrations.

6.3.1 Attach one copy to inspection card.

6.3.2 Send one copy to Substation O&M services.

6.3.3 Note if know problems with design.

6.4 Heaters should have been on prior to inspection and should be left on permanently. If heaters were not on HiPot and megger test results may not be accurate.

6.5 If A, B, C phase identification is not known H1, H2, H3 etc. can be used to identify bus phases.

6.5.1 Attach a diagram if necessary to identify what was tested.

6.6 Isolate and Hi-pot test all buses.

Operating Voltage Rating (kV)	AC Test Voltage (kV)	DC Test Voltage (kV)
4.8	14	20
15	27	37
25	45	63
38	60	----------

6.6.1 Apply test voltage for I minute after reaching full voltage.

6.6.2 Record Hi-pot current, kV, AC or DC test and Pass/Fail.

6.6.3 Test is considered to have passed if test voltage can be applied without flashover.

6.6.4 If test voltage can not be reached suspect one, or more, bad insulators.

a. This can also be caused by AC Hi-pots with insufficient current capacity.

b. Split the area under test into 2 or more sections and retry.

c. See Appendix B, at the end of this document, for method to hot collar test individual insulators without disconnecting them.

6.6.5 If problems are found contact Substation O&M Services before scheduling major work.

6.7 Micro-ohm test all bus phases and neutrals at 100 amps.

6.7.1 Record readings.

6.7.2 See Appendix B, at the end of this document, for test method.

6.8 Enclosed and Metal-clad Busses

6.8.1 Open all access covers

6.8.2 Visually inspect for corrosion and water/moisture damage.

a. Record any found.

6.8.3 Check for tracking on inter-cubicle spacers, bus coverings, and other insulation.

a. Record any found.

b. See Appendix D for pictures of typical examples.

6.8.4 Visually inspect insulators for surface contamination, surface damage or deterioration, and tracking.

a. Record any found.

b. See Appendix D for pictures of typical examples.

c. Clean as necessary. See Appendix C for acceptable cleaning materials.

6.8.5 Visually inspect bolted electrical connections for signs of overheating.

a. Do not remove insulation unless problems are suspected.

b. Record any found.

6.8.6 Visually inspect all primary cable terminations for damage or deterioration.

a. Record any found

6.9 Repeat Hi-Pot test after cleaning and inspection.

6.10 Repeat micro-ohm tests on any sections where primary current carrying parts were disassembled.

6.11 Circuit Breakers and Cubicles

6.11.1 Visually inspect for corrosion and water/moisture damage.

a. Record any found.

b. Clean as necessary. See Appendix C for acceptable cleaning materials

6.11.2 Visually inspect racking mechanisms.

a. Lubricate as required

6.11.3 Visually inspect potential transformers, and their disconnecting devices, if safe and applicable

6.11.4 Visually inspect control power (station service) transformers, and their disconnecting devices, if safe and applicable.

6.11.5 Rack out all breakers removed from service (switched out) and inspect;

a. Insulators and stabs.

b. Breaker and cubicle grounding.

c. Inspect bus side HV connections and insulators if bus de-energized.

d. Inspect control power connections and disconnecting connectors.

6.12 Inspect bus and feeder HV connections, insulators and potheads if de-energized.

7.0 THERMOGRAPHIC INSPECTION

7.1 Class 2 rubber gloves are required when opening doors or removing covers on compartments containing energized components that are not insulated of guarded.

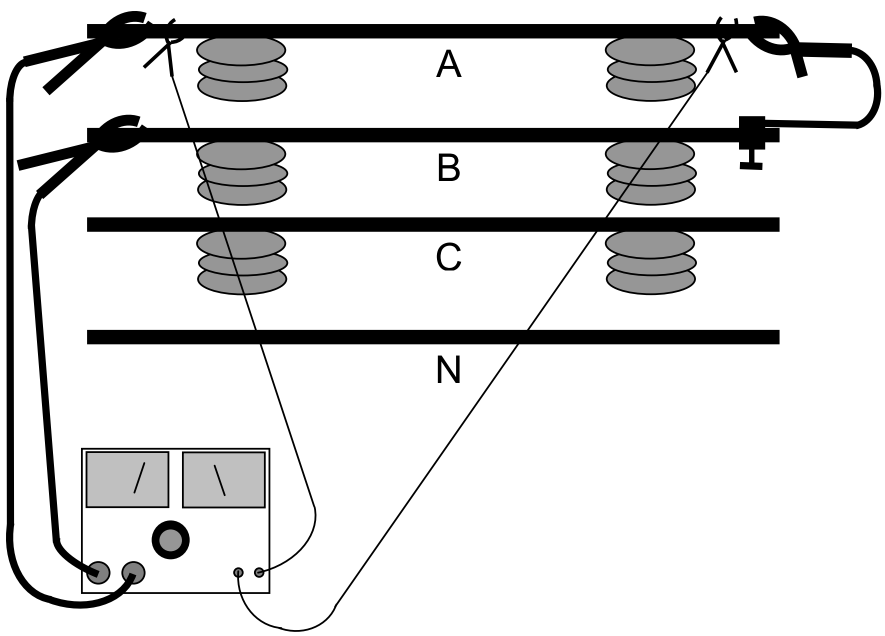
7.2 Do not open unhinged, bolted access covers unless specifically told to by your supervisor.

7.3 Do not break the plane of the door frame with any body part if the compartment contains primary voltages that are not fully guarded or insulated.

7.4 Check all accessible, high voltage, current carrying parts for abnormal temperatures.

7.5 Scan metal-clad busses for abnormal temperatures.

8.0 APPENDIX A - CONTACT RESISTANCE TEST BUS SECTIONS



8.1 Isolate the bus.

8.2 Use a 100 amp Contact Resistance Test Set

8.3 Test A Phase

8.3.1 Connect the current (heavy wire) leads to A and B phases at the near end of the Bus

8.3.2 Connect the same color voltage (small wire) lead to A phase at the near end of the bus inside of the current lead.

8.3.3 Short A and B phases together at the far end of the bus with a heavy duty ground.

8.3.4 Extend the other voltage lead to reach the far end of the bus.

a. Wire size is not important #12 or # 16 wire is fine.

8.3.5 Connect the extended voltage lead inside of the ground at the far end of the bus.

8.3.6 Measure and record the A phase bus resistance.

8.4 Test B Phase

8.4.1 Move both voltage leads to the same positions on B Phase.

8.4.2 Reverse the voltage leads at the test set or reverse the current leads on A and B bus.

8.4.3 Measure and record the B phase bus resistance.

8.5 Test C Phase

8.5.1 Move all of the B phase current and voltage leads to the same positions on C Phase.

8.5.2 Move the B phase ground end to C phase.

8.5.3 Reverse the voltage leads at the test set or reverse the current leads on B and C bus.

8.5.4 Measure and record the C phase bus resistance.

8.6 Test Neutral bus, if applicable.

8.6.1 Move all of the C phase current and voltage leads to the same positions on Neutral.

8.6.2 Move the C phase ground end to Neutral.

8.6.3 Reverse the voltage leads at the test set or reverse the current leads on C and Neutral bus.

8.6.4 Measure and record the Neutral bus resistance.

8.7 All phase readings should be similar, neutral may be different.

8.8 If one or more tests look suspicious:

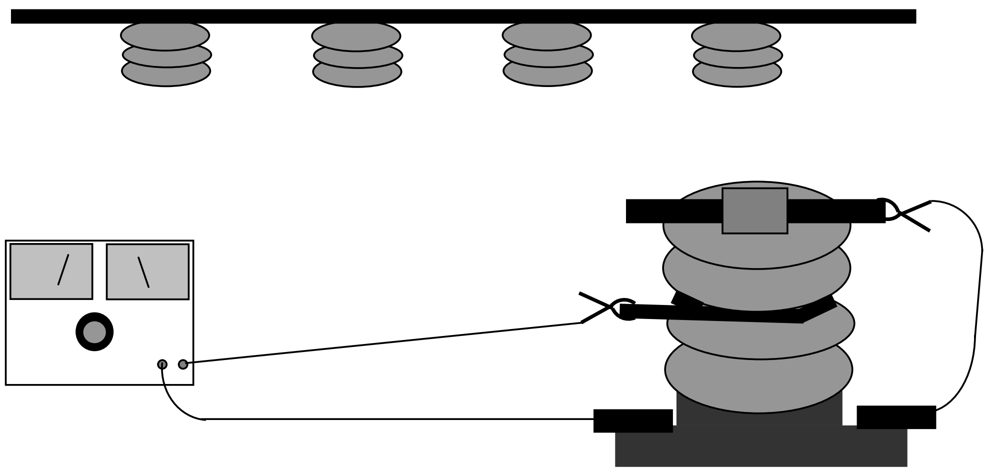
8.8.1 Carefully inspect connections for signs of overheating.

8.8.2 If visual inspection fails to identify the problem set the test back up and start moving the far end voltage lead back toward the near end in steps.

a. A faster method is to test at the mid point, and then half way in the bad section etc.

8.9 If you are having difficulty evaluating the results contacts O&M Substation Services for guidance.

9.0 APPENDIX B - LOCATING BAD INSULATORS



9.1 Isolate and ground the bus phase.

9.2 The bus does not have to be disconnected from the top of the insulator.

9.3 Use the Hi-Pot or a 5000 volt megger for the test.

9.4 Use a conductive strap (Doble type) around the center of the insulator.

9.4.1 If a strap is not available wrap bare wire around the insulator.

9.4.2 It is not necessary to be in the exact center (odd number of skirts).

9.5 Attach the hot lead from the megger or Hi-Pot to the strap.

9.6 Good insulators should be above 1 giga-ohm.

9.7 If using a Hi-Pot the insulation resistance in giga-ohms is voltage in kV (5000 v= 5 kV) divided by the current in micro-amps.

9.8 Example: 5000 volts divided by 2 micro-amps = 2.5 giga-ohms (5 divided by 2 = 2.5).

9.9 Also compare insulators to each other.

9.10 If you believe multiple insulators are bad contact O&M Substation Services for guidance before doing major work.

10.0 APPENDIX C - CLEANING MATERIALS

10.1 Porcelain insulators and bushings.

10.1.1 Clean dry rag.

10.1.2 If not sufficient red Scotch Brite© pad.

10.1.3 Windex window cleaner can also be used. Wipe with clean, dry rag before testing.

10.2 Polyester resin, cycloaliphatic, and epoyglass insulators and bushings.

10.2.1 Clean dry rag.

10.2.2 If not sufficient Windex window cleaner can be used. Wipe with clean, dry rag before testing.

10.2.3 Do not use Scotch Brite©.

10.3 Bus insulation

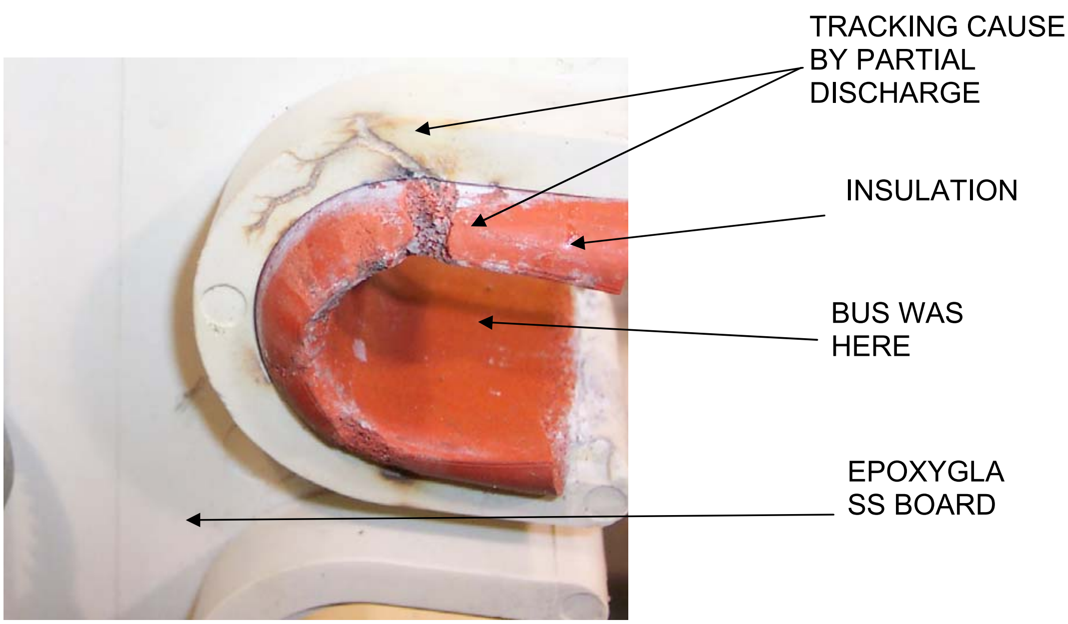
10.3.1 Clean dry rags or vacuum.

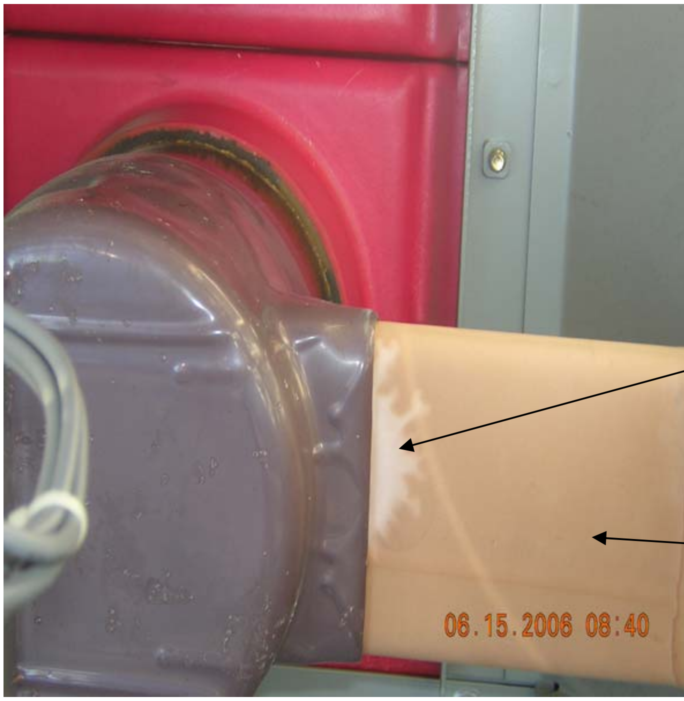
10.4 Fiberboard, epoxyboard and similar insulation.

10.4.1 Clean dry rags or vacuum.

10.5 If the above are not sufficient contact Substation O&M Services for guidance.

11.0 APPENDIX D - TYPICAL EVIDENCE OF TRACKING





12.0 REVISION HISTORY

Version	Date	Description of Revision
1.0	06/07/07	New Procedure
1.1	07/31/07	Test Equipment Required Added – Digital Camera V&O Inspection Added – Safety Requirements and precautions at beginning Diagnostic Inspection Revised - Section Thermographic Inspection Added – Safety Requirements and precautions at beginning Document Added – Appendix C – Cleaning Materials Added – Appendix D – Pictures of tracking
2.0	09/30/09	Converted to new EDO format - content unchanged

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nationalgrid	SUBSTATION MAINTENANCE **Standard**	Doc. # **SMS 417.01.1** Page 1 of 6
	Substation Bus	Version 2.0 – 04/12/10

INTRODUCTION

This standard defines the inspections associated with substation bus. The types of inspection mentioned are V&O, diagnostic, and acceptance. An AIMMS Constants Table is also provided.

PURPOSE

The purpose of this standard is to define the maintenance standard for substation bus.

ACCOUNTABILITY

Not Applicable

COORDINATION

Not Applicable

REFERENCES

Not Applicable

DEFINITIONS

Not Applicable

TRAINING

Not Applicable

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1.0 V&O INSPECTION

1.1 Outdoor Open Air Bus

1.1.1 Check Supporting Structure

1.1.2 Check Paint and Preservation

1.1.3 Visually Inspect Structure for Loose or /Missing Hardware

1.1.4 Check Structure Grounds

1.1.5 Check for Signs of Overheating.

1.1.6 Check Bus Support Insulators for Contamination or Damage

1.1.7 Check lightening protection rods and masts for damage or deterioration

1.2 GIS

1.2.1 Check and Record SF6 Pressures and temperature.

1.3 Metal Clad

1.3.1 Check ground grid/ground rod connections to metal clad.

1.3.2 Verify bus enclosure and breaker cubicle heaters working.

1.3.3 Inspect cable entries for animal proofing

1.3.4 Inspect perimeter of metal clad (ground level) for possible animal entry points.

1.3.5 Inspect walk-in switch gear, metal-clad substation, and bus enclosure for condition of gasketed/sealed joints.

1.3.6 Verify operation of ventilating fans and shutters, if installed

1.3.7 Inspect building and compartment air filters, clean as required

1.3.8 Verify operation of air conditioners, if installed

1.3.9 Inspect metal-clad switchgear, substation and bus enclosure for corrosion and water or moisture damage.

1.3.10 Record any found.

1.3.11 Listen for any indication of arcing or tracking within the switch gear, metal-clad substation or bus enclosure.

1.3.12 Check Indoor Lights

2.0 THERMOGRAPH INSPECTION

2.1 Verify normal operating temperature.

3.0 DIAGNOSTIC INSPECTION

3.1 Perform the applicable V&O Inspections listed above.

3.1.1 Outdoor Open Air Bus

a. Visually check welds and open and closed bus end points.

b. Visually check tubular aluminum bus free from dents, abrasions, discolorations, and other surface damage

c. Visually check insulated bus insulation for damage or deterioration.

3.1.2 GIS

a. Perform Conditioning and HiPot Tests.

3.2 Metal Clad

3.2.1 Bus Enclosures

a. Open all access covers and visually inspect for corrosion and water/moisture damage.

3.2.2 Busses (Enclosed and Metal-clad)

a. Visually inspect insulators for surface contamination, surface damage or deterioration and tracking.

b. Check for tracking on inter-cubicle spacers, bus coverings, and other insulation.

c. Visually inspect bolted electrical connections for signs of overheating.

d. Visually inspect all primary cable terminations for damage or deterioration.

e. Isolate and Hi-pot test all buses.

3.2.3 Circuit Breakers and Cubicles

a. Visually inspect for corrosion and water/moisture damage.

b. Visually inspect racking mechanisms.

c. Perform first trip Profiler test on all breakers removed from service (switched out). Previously taken Profiler data may be used if less than 2 years old.

d. Visually inspect potential transformers, and their disconnecting devices, if applicable

e. Visually inspect control power (station service) transformers, and their disconnecting devices, if applicable

f. Rack out all breakers removed from service (switched out) and inspect insulators, stabs, breaker and cubicle grounding, and control power connections/connectors.

g. Inspect bus and feeder HV connections and insulators if bus and feeder getaways are de-energized.

h. Micro-ohm test all bus phases and neutrals.

4.0 ACCEPTANCE INSPECTION

4.1 Perform the applicable V&O and Diagnostic Inspections listed above.

4.2 Outdoor Open Air Bus

4.2.1 Visually verify phasing.

4.2.2 Verify that bus dampening conductor has been installed in all horizontal, tubular, aluminum bus sections in accordance with the drawings.

4.2.3 Verify that bus expansion fittings have been installed in accordance with manufacturer's recommendations.

4.2.4 Verify that all "slip fit" bus support fittings have a static eliminator springs installed.

4.2.5 Check that horizontal bus runs have drain holes in the bus and that they are free of debris.

4.2.6 Verify taps to equipment are installed meet required phase-to-ground clearances (e.g. 9ft 4in).

4.2.7 The following measurements shall be performed before initial energization.

a. Measure and record the resistance of all bolted connections, using a minimum of 100-ampere micro-ohmmeter.

b. Check all structural bolted connections for tightness and for correct hardware.

4.2.8 Verify Lightning protection rods and masts installed as required by prints.

4.2.9 Verify all ground grid connections correctly installed as required by prints.

4.2.10 Electrically test and verify phasing.

5.0 AIMMS CONSTANTS TABLE

Type Inspection	Interval (months)	FOP	ROP	AIMMS PM	Comments
V&O	2			STAVO2	
Thermographic	12			STATHERM	
Diagnostic Outdoor Open Air GIS Metal Clad	As Required As Required 120 As Required				

6.0 REVISION HISTORY

Version	Date	Description of Revision
1.0	12/26/06	Initial version of document.
1.1	06/07/07	V&O Inspection – Metal Clad Section – Extensive Revisions Diagnostic Inspection – Metal Clad Section – Extensive Revisions Document Added - Documentum Version # to headers Added - File name to footer
1.2	01/23/09	V&O Inspection - Outdoor Changed Outdoor to Outdoor Open Air Bus Added – Check lightening rods for damage or deterioration Diagnostic Inspection Added – Outdoor Open Air Bus AIMMS Constants Table – Diagnostic Inspection Added – Outdoor Open Air Bus Acceptance Inspection Added – Section
2.0	04/12/10	Converted to new format. Added "As Required" in the "Interval (months)" column for Metal Clad Type Inspection in AIMMS Constants Table.

Division 1-3 (Electric)
Asset Condition

Request:

Provide list of breakers to be replaced.

Response:

Our approach for breaker replacement involves a condition assessment coding of 1 through 4 as described in the below table. Breakers are assessed using bi-monthly visual and operational inspections and annual Infrared inspections. Breakers receive mechanical inspections every two or six years depending upon the type of breaker. Based on this data, and based on the trouble calls, these breakers are coded according to the below table. While many breakers in our system have condition codes 1, and only those breakers with condition codes 2, 3, and 4 are reviewed for replacement. In addition to condition codes, many substations have impact codes representing the relative importance of interruptions at the substation. This helps to prioritize which breakers to replace. We also target breaker families for replacement in an accelerated manner due to the age and poor reliability. Below are those breaker families that are targeted for replacement in FY14:

General Electric (GE) Type VIR reclosers (OCR) - These oil-filled reclosers are installed at outdoor locations. They are obsolete due to unavailability of spare parts, increasing maintenance requirements and increasing in-service failures. The units in this family are condition code 3 and recommended for replacement within the next five years. Substation Maintenance Standard SMS 401.40.1 provides the detailed conditions to justify unit replacement. In general, these units will be replaced as part of one-for-one replacement projects. Three of these breakers are planned to be replaced at the Waterman Ave Substation in FY14.

ITE Type KS breakers (OCB) - These breakers are installed at outdoor locations and are oil-filled circuit breakers. These units are obsolete due to mechanism issues. While many of the breakers in this group have condition codes of 1, only the units with condition codes of 2 or 3 are recommended for replacement at the present time. The remaining condition code 1 breakers will be monitored and the condition codes of those breakers will be updated over time. In general, these units will be replaced as part of one-for-one replacement projects. Two of these breakers are planned to be replaced at Anthony Substation in FY14.

McGraw-Edison (ME) Type VSA reclosers (VCR) - These reclosers are installed at outdoor locations and specific units within a given manufacture-date range and serial-number range are obsolete due to current interchanger issues. 560 Amp VSA reclosers rated 560 Amp and 800 Amp manufactured between 1986 and 1990 having serial numbers in the 4000 range should be replaced. The units in this family are condition code 2 and recommended for replacement within the next five to ten years. SMS 401.41.1 provides the detailed conditions to justify unit replacement. In general, these units will be replaced as part of one-for-one replacement projects. Four of these breakers are planned to be replaced in FY14, two at Waterman Ave. Substation and two at Anthony Substation.

Westinghouse (WE) Type DHP breakers (AM) - These breakers are installed at metalclad locations and are air magnetic breakers. These units are obsolete due to mechanism issues. It is possible to refurbish the interrupters with vacuum technology. The units in this family are recommended for replacement/ refurbishment within the next ten years, prioritized by condition and impact. These breakers are being replaced under an on-going program and are one-for-one replacements. They are being replaced with vacuum interruption technology, which requires less maintenance and extends the inspection intervals. Six of these breakers are planned to be replaced in FY14 at E. George Street Substation.

Division 1-3 (Electric)
Asset Condition, page 3

Condition Code	Classification/Condition	Implication
1 Proactive	• Asset expected to operate as designed for more than 10 years	Appropriate maintenance performed; regular inspections performed
2 Proactive	• Some asset deterioration or known type/design issues • Obsolescence such that spares/replacement parts are not available • System may require a different capability at asset location	Asset likely to be replaced or refurbished in five to ten years; increased resources may be required to maintain/operate asset
3 Proactive	• Asset condition is such that there is an increased risk of failure • Test and assessment identifies definite ongoing deterioration	Asset likely to be replaced or refurbished in less than five years; increased resources may be required to maintain/operate asset
4 Reactive	• Asset has sudden and unexpected change in condition that is of immediate concern • This may be detected through routine diagnostics including inspections, annual testing, maintenance or following an event	Testing and assessment required to determine if asset may be returned to service or may be allowed to continue in service Following engineering analysis the asset will be either recoded to 1-3 or removed from the system

Table 1 - Substation Asset Condition Code Definitions

Prepared by or under the supervision of: Jennifer Grimsley

Division 1-4 (Electric)
Statutory/Regulatory

Request:

Please provide the number of new customers (Residential, Commercial, and Industrial) expected in FY14.

Response:

The Company's current sales forecast for new customers between March 2013 and March 2014 is as follows:

Residential customers: an increase of 1,604 customers (or 0.37% of Residential customers)
Commercial customers: an increase of 188 customers (or 0.32% of Commercial customers)
Industrial Customers: a decrease of 26 customers (or 1.32% of Industrial customers)

Prepared by or under the supervision of: Jennifer Grimsley

Division 1-5 (Electric)
Statutory/Regulatory

Request:

Revise Statutory/Regulatory budget downward in light of Q2 FY13 forecast. Provide better specificity regarding specific project expectations (i.e. Shunpike) in addition to the blanket spending trends.

Response:

Attachment DIV 1-5 (Statutory/Regulatory) provides a revised reduced budget for statutory/regulatory spending based on historic spending through the second quarter of FY13. This proposal reduces the statutory/regulatory budget by $2.6 million, or 14 percent. If the economy were to recover more quickly than anticipated by this reduced level of spending, we would spend as necessary to provide service to customers, as the mechanism exists in the ISR for recovery of actual spending in the Statutory/Regulatory category.

Attachment DIV 1-5 (Statutory/Regulatory) also provides budget expectations for both blanket and specific projects in the statutory/regulatory category.

Prepared by or under the supervision of: Jennifer Grimsley

Summary of Stautory Regulatory Adjustments: December 2012
Narragansett Electric Distribution Capital Budget
FY2014

Project	Project Description	11-5-12 Proposal	Revised	$$ Reduction	% Reduction	Basis for change, if any
COS022	Third Party Attachments Blanket	514,000	514,000	-	0%	Budget is in line with recent and historical spend within the blanket category
Multiple	Distributed Generation Specifics	162,000	162,000	-	0%	Two specific projects forecasted are likely to proceed (Projects CD1024 and PPM 19241)
COS009	Land and Land Rights Blanket	280,000	190,000	(90,000)	-32%	Lower spending expectations in line with recently experienced spend rates
COS004	Meter Installation Blanket	657,000	572,000	(85,000)	-13%	Lower spending expectations in line with recently experienced spend rates
CN4904	Meter Purchase Blanket	1,180,000	1,180,000	-	0%	Budget is in line with recent and historical spend within the blanket category. (Note: Includes replacements, not solely new customers.)
COS011	New Business Commercial Blanket	3,246,000	3,050,000	(196,000)	-6%	Lower growth expectations in line with recently experienced spend rates
Multiple	New Business Commercial Specifics	750,000	750,000	-	0%	Three projects specifically forecasted (two projects are for Shunpike), all likely to proceed. (Projects CD0722, CD0723, PPM 9453)
RESERVE 049_011 LINE	Reserve for New Business Commercial Unidentified Specifics & Schedule Changes	1,000,000	500,000	(500,000)	-50%	Reduce reserve which moves New Business Commercial total towards recent spending levels
COS010	New Business Residential Blanket	3,348,000	3,025,000	(323,000)	-10%	Lower growth expectations in line with recently experienced spend rates
COS012	Outdoor Lighting Blanket	537,000	537,000	-	0%	Budget is in line with recent and historical spend within the blanket category
COS013	Public Requirements Blanket	984,000	984,000	-	0%	Budget is in line with recent and historical spend within the blanket category
Multiple	Public Requirements Specifics	2,315,000	2,315,000	-	0%	Twelve projects specifically forecasted. (Projects C08775, C35087, C35764, C36683, CD0002, CD0076, CD0135, CD0138, CD0189, CD0766, CD0996, CD0997). Reserves will be reduced to account for schedule changes.
RESERVE 049_013 LINE	Reserve for Public Requirements -- Net impact of Unidentified Specifics, Reimbursements & Schedule Changes	300,000	(700,000)	(1,000,000)	-333%	To reduce total spending within category. It appears schedule changes and reimbursement have kept spending lower than current budgeted levels for several years. Therefore, we will reduce overall budget levels for the category.
CN4920	Narragansett Transformer Purchases	3,836,000	3,430,000	(406,000)	-11%	Reduction made in approximately same percentage as reduction of New Business categories. Slight increase from FY13 forecast for purchases related to increase in change-outs of overloaded transformers
		19,109,000	**16,509,000**	**(2,600,000)**	-14%	

Division 1-6 (Electric)
General

Request:

Provide updated five-year capital plan.

Response:

Attached is the Company's five-year capital plan from which the FY14 ISR was developed. In this plan, FY14 is shown with the Statutory/Regulatory category as originally proposed in the November 5, 2012 plan. Each year the Company updates the five-year plan to reflect current needs, project schedules, and available resources.

Prepared by or under the supervision of: Jennifer Grimsley

	Data				
SPENDING RATIONALE	**FY14 Capital Budget**	**FY15 Capital Budget**	**FY16 Capital Budget**	**FY17 Capital Budget**	**FY18 Capital Budget**
Statutory/Regulatory	19,109,000	18,817,000	18,661,000	19,801,000	20,827,000
Damage/Failure	10,050,000	10,476,000	10,818,000	11,154,000	11,499,000
Non-Infrastructure	255,000	261,000	267,000	272,000	278,000
System Capacity & Performance	13,544,000	25,545,000	27,756,000	21,096,000	20,658,000
Asset Condition	21,042,000	24,901,000	22,498,000	25,677,000	24,738,000
Grand Total	64,000,000	80,000,000	80,000,000	78,000,000	78,000,000

		Data				
SPENDING RATIONALE	**BUDGET CLASS**	**FY14 Capital Budget**	**FY15 Capital Budget**	**FY16 Capital Budget**	**FY17 Capital Budget**	**FY18 Capital Budget**
Statutory/Regulatory	3rd Party Attachments	514,000	529,000	545,000	561,000	578,000
	Distributed Generation	162,000	-	-	-	-
	Land and Land Rights	280,000	296,000	314,000	333,000	353,000
	Meters - Dist	1,837,000	1,956,000	2,077,000	2,211,000	2,358,000
	New Business - Commercial	4,996,000	4,961,000	4,889,000	5,225,000	5,576,000
	New Business - Residential	3,348,000	3,563,000	3,791,000	4,029,000	4,282,000
	Outdoor Lighting - Capital	537,000	556,000	576,000	595,000	615,000
	Public Requirements	3,599,000	2,964,000	2,318,000	2,489,000	2,565,000
	Transformers & Related Equipment	3,836,000	3,992,000	4,151,000	4,358,000	4,500,000
Statutory/Regulatory Total		**19,109,000**	**18,817,000**	**18,661,000**	**19,801,000**	**20,827,000**
Damage/Failure	Damage/Failure	9,375,000	9,776,000	10,093,000	10,404,000	10,724,000
	Major Storms - Dist	675,000	700,000	725,000	750,000	775,000
Damage/Failure Total		**10,050,000**	**10,476,000**	**10,818,000**	**11,154,000**	**11,499,000**
Non-Infrastructure	General Equipment - Dist	105,000	111,000	117,000	122,000	128,000
	Telecommunications Capital - Dist	150,000	150,000	150,000	150,000	150,000
Non-Infrastructure Total		**255,000**	**261,000**	**267,000**	**272,000**	**278,000**
System Capacity & Performance	Load Relief	10,396,500	19,271,000	23,188,000	16,485,000	16,052,000
	Reliability - Dist	3,147,500	6,274,000	4,568,000	4,611,000	4,606,000
System Capacity & Performance Total		**13,544,000**	**25,545,000**	**27,756,000**	**21,096,000**	**20,658,000**
Asset Condition	Asset Replacement	11,877,000	13,571,000	10,888,000	13,762,000	12,481,000
	Asset Replacement - I&M (NE)	8,515,000	10,655,000	10,960,000	11,265,000	11,570,000
	Safety	650,000	675,000	650,000	650,000	687,000
Asset Condition Total		**21,042,000**	**24,901,000**	**22,498,000**	**25,677,000**	**24,738,000**
Grand Total		64,000,000	80,000,000	80,000,000	78,000,000	78,000,000

Division 1-7 (Electric)
General

Request:

Review/confirm historical analysis provided by Greg Booth on 11/29/12.

Response:

The Company has reviewed the summary FY 2010 to FY 2018 spreadsheet provided on 11/29/2012 and offers the following corrections and updates:

In the "FY 2012 Actual" column, the "Inspection and Maintenance" section:

- Opex Related to Capex should be $1,316,275 not ($1,725,285);
- Repair Related Costs should be $0 not ($609,000) and
- Inspections Related Costs should be $149,609 not $144,945.

These figures (rounded) can be found on page 26 of the FY 2012 Electric Infrastructure, Safety and Reliability Plan Reconciliation Filing in RIPUC Docket 4218.

In the "Initial FY 2013 Proposed Budget" and "Filed FY13 Proposed Budget" columns, there appears to be a formula error. The "Total Electric Distribution (excluding flood)" and the "Total Electric Distribution" figures are not correctly derived from the "Grand Total" in each column. The "Grand Totals" in each column are correct.

The Company is providing an update to the FY 2015 through FY 2018 budget figures in Division 1-6 (Electric) General.

Prepared by or under the supervision of: Jennifer Grimsley

Division 1-8 (Electric)
System Capacity & Performance

Request:

Provide capacity analysis information by circuit for distribution system analysis.

Response:

The Company is providing an example distribution analysis table on CD-ROM. This table lists all feeders in Rhode Island. This example table shows the normal configuration analysis. The review covers a 15-year period; however, solutions are developed for issues within years 1 to 5. The base year, in this case 2011, shows actual loading on the facilities. Each subsequent year shows: 1) the applied growth rate; 2) any "Spot Load" adjustments due to new large customer loads and/or switching transfers between existing and new facilities; 3) the revised projected amps; and 4) the percent summer normal ("%SN") loading.

Prepared by or under the supervision of: Jennifer Grimsley

Division - Set 2

Division 2-1 (Electric)
Miscellaneous

Request:

Section 2, page 15 of 39: The Company stated that spending to enable third-party attachments varies year-to-year based on timing of contributions from third parties and the cost to make sure the Company's assets meet the standards required to enable the attachments. Why does the Company incur any cost for make ready of 3rd party attachers? Does the Company require payment for make ready prior any upgrades of Company facilities to accommodate 3rd party attachers?

Response:

There are three main reasons why the Third Party Attachments budget classification is not a 100-percent reimbursed "net Zero" category:

1) The third-party attacher for whom the work is being performed is billed up front based on an estimated cost of the work. Any over/under of actual costs versus this estimate ends up as costs/credits in the project.

2) A payment may be received in one fiscal year while the work is performed in part or wholly in another fiscal year.

3) Projects include unreimbursed costs for bringing the Company's asset to current Company work standards. More specifically, if the pole is currently in compliance with NESC and National Grid Standards, third-party attachers are charged the costs associated with making the necessary space available on the pole. However, if the pole is currently out of compliance due to pre-existing non-conforming conditions, the cost of that work is not billed to the third-party attacher. If a pole set is required, it is the maintaining party's responsibility to bill the attacher the full cost of the pole set.

Division 2-2 (Electric)
Miscellaneous

Request:

Section 2, page 17 of 39: Major Storms-Based on the most recent storms, have planned capital upgrades been reduced based on storm repairs? Should the capital requirement be reduced based on the significant storm repairs?

Response:

The Company does not feel it is appropriate to reduce the level of the planned capital upgrade/replacement budget due to Major Storm repairs, such as from Tropical Storm Irene or Hurricane Sandy, as these capital repairs affect a relatively small amount of capital plant on the system. For example, these major storms can require pole replacements on an order of magnitude of several hundred poles, but given the approximately 280,000 distribution poles in Rhode Island, this is an extremely small percentage. Therefore, the impact of storm-related pole replacements on a large asset replacement program such as Overhead Inspection and Maintenance is not expected to have a sizable impact on the overall program spending. It should be noted as well that the Company's Asset Replacement portion of the capital budget includes several items that are less affected by storms such as underground cables and substation equipment.

Division 2-3

Miscellaneous

Request:

Section 2, page 23 of 39: Network Arc Flash Program-Please provide the Company analysis that identified the incident energy levels on the 480V spot network systems. Are the systems typical network systems that have multiple sources to minimize outages? Provide the connective measures recommended. Is the $.55 million for FY2014 1/5 of the total five year costs? If not, provide future cost estimate for this program.

Response:

Please refer to Attachment Elec ISR-DIV 2-3 which is National Grid's "Distribution Secondary Network Arc Flash Study," dated June 2012, pages 1-29 and Appendices A, B, C, and D.

Yes, the systems are typical network systems that have multiple sources to minimize outages.

The Company is planning on installing both secondary and primary isolation equipment for each 480 volt network unit. The specifications for the primary and secondary isolation devices recommended are listed in Section 6.3 of the attached National Grid's "Distribution Secondary Network Arc Flash Study."

The $.55 million for FY2014 was 1/5 of the total five year cost. However, the Company has proposed extending the duration of the project by one year to establish a defined and efficient plan. As a result the following revised fiscal year cost estimates are provided:

FY2013: $0.02 million
FY2014: $0.25 million
FY2015: $0.51 million
FY2016: $0.51 million
FY2017: $0.51 million
FY2018: $0.25 million
Total: $2.058 million

Prepared by or under the supervision of: Jennifer L. Grimsley

DISTRIBUTION SECONDARY NETWORK ARC FLASH STUDY

JUNE 2012

DANIEL J. MUNGOVAN, P.E.

DISTRIBUTION SECONDARY NETWORK ARC FLASH STUDY

JUNE 2012

DANIEL J. MUNGOVAN, P.E.

TABLE OF CONTENTS

1 EXECUTIVE SUMMARY

The purpose of this study is to complete the National Electric Safety Code required arc flash hazard analysis for distribution secondary network systems. National Grid operates distribution secondary network systems at 208Y/120 volts and 480Y/277 volts.

The arc flash hazard for work assignments within a 208 volt network vault utilizing existing standards, work methods, and tools requires clothing with a minimum effective arc rating of 8 cal/cm^2.

Industry testing on 480 volt network protectors indicates arcs will not self-extinguish, requiring an arc flash hazard analysis to be performed for each specific work assignment. The calculated incident energy levels for the 330 National Grid installations utilizing existing standards, work methods, and tools ranged between 1,500 cal/cm^2 and 11,770 cal/cm^2.

However, engineering controls along with modifications to National Grid standards, work methods, and tools would decrease the calculated incident energy of all 480 volt spot network installations to a level below 8 cal/cm^2.

The recommended engineering controls and associated study-grade project cost for in-service units are as follows:

- Install secondary isolation equipment on each 480 volt network protector………..$4,905,000
- Install primary isolation equipment on each 480 volt network transformer, including existing units equipped with a mag-break transformer oil disconnect and grounding switch …………………………………………………………..$15,696,000
- Install ground fault detection systems where practical……………………………….$210,000

Total study grade cost estimate for all recommended improvements……………………...$20,811,000

Until the recommended engineering controls are implemented, work assignments within network protector enclosures or a collector bus may result in de-energizing 480 volt spot network systems for routine maintenance and emergency procedures resulting in an interruption of service to the customer.

Details in support of these recommendations follow.

2 INTRODUCTION

The purpose of this study is to complete the National Electric Safety Code required arc flash hazard analysis for distribution secondary network systems (network systems). National Grid operates network systems at 208Y/120 volts and 480Y/277 volts.

2.1 NATIONAL ELECTRIC SAFETY CODE

The 2012 version of the National Electric Safety Code (NESC) [1] effective February 1, 2012 has removed the following exception which was present in previous releases of the NESC [2]:
"For secondary systems below 1000V, applicable work rules required by this part and engineering controls shall be utilized to limit exposure. In lieu of performing an arc hazard analysis, clothing or a clothing system with a minimum effective arc rating of 4 cal/cm^2 shall be required to limit the likelihood of ignition." Ongoing research and industry testing is addressing the changes to the NESC.

2.2 208Y/120 VOLT NETWORK SYSTEMS

208 volt network system faults self-extinguished in all industry tests [3]. The test results show low incident energies in network protectors at 208 volts and generally support using single layer flame resistance clothing for 208 volt equipment. The resultant recommendation from Table 410-1 of the 2012 NESC is clothing or clothing system with a minimum effective arc rating of 4 cal/cm^2 shall be required on 208 volt network systems. However, the minimum effective arc rating for an underground clothing system at National Grid per the safety policy [4] is 8 cal/ cm^2.

The arc flash hazard for work assignments within a 208 volt spot network vault utilizing existing standards, work methods, and tools requires clothing with a minimum effective arc rating of 8 cal/cm^2 per National Grid's safety policy.

2.3 480Y/277 VOLT NETWORK SYSTEMS

Industry testing on 480 volt network protectors indicates arcs will not self-extinguish and heat flux rates will exceed 60 cal/cm^2, requiring an arc flash hazard analysis to be performed for each specific work assignment [1]. Industry testing within the network protector enclosure produced the highest levels of incident energy [5, 6]. National Grid currently has 330 in-service 480 volt network protectors. Table 1 below shows the number of 480 volt network protectors in each network system per the results of the equipment survey completed in 2011. A number of new installations are scheduled to be completed in 2012.

Division	Network System	Number of Network Protectors
New England North	Lynn	3
New England North	Worcester	37
New England South	Brockton	2
New England South	Pawtucket	0
New England South	Providence	32
New York East	Albany	26
New York East	Albany (34.5kV)	29
New York East	Glens Falls	0
New York East	Schenectady	9
New York East	Troy	2
New York Central	Cortland	0
New York Central	Syracuse (Ash)	30
New York Central	Syracuse (Temple)	45
New York Central	Utica	8
New York Central	Watertown	2
New York West	Buffalo (Broadway)	0
New York West	Buffalo (Elm)	105
New York West	Niagara Falls	0

Table 1: Number of 480 Volt Network Protectors by Network System

3 EVALUATION OF 480V NETWORK SYSTEM WORK ASSIGNMENTS

The potential work assignments within a 480 volt spot network system were evaluated and categorized depending on which assets within the vault the work would take place and the potential for a flash to occur.

3.1 VISUAL INSPECTIONS AND 208Y/120 VOLT SYSTEMS

The arc flash hazard for work assignments within a 480 volt spot network vault which involve 208Y/120 volt systems or visual inspection without opening enclosures utilizing existing standards, work methods, and tools requires clothing with a minimum effective arc rating of 8 cal/cm^2 per National Grid's safety policy [4].

3.2 PRIMARY CABLE SYSTEM

Work assignments on the primary cable or primary cable terminations would be completed under a clearance with the primary cable isolated and de-energized, grounds installed at the source substation, and electrically adjacent network transformer oil disconnect and grounding switches in the ground position, grounding the primary cable [7]. The network protectors would be switched to the open position, but the network protector doors would remain closed and sealed throughout the work assignment.

Examples of work assignments on the primary cable system include but are not limited to primary cable installation, splicing, terminating, maintenance, and removal.

The arc flash hazard for work assignments on the primary cable system utilizing existing standards, work methods, and tools requires clothing with a recommended minimum effective arc rating of 8 cal/cm^2.

3.3 OPERATING NETWORK TRANSFORMER OIL DISCONNECT AND GROUNDING SWITCHES

3.3.1 DEAD BREAK TRANSFORMER OIL DISCONNECT AND GROUNDING SWITCH

The majority of the installed National Grid network transformer oil disconnect and grounding switches are dead break operation only. The switches have two electrical interlocks energized by different phases of the network transformer's secondary winding. The interlocks prevent movement of the switch from any position when the transformer is energized. A dead break transformer oil disconnect and grounding switch is only operated with the primary circuit de-energized, tested de-energized, and with the associated network protector in the open position.

The arc flash hazard for work assignments involved with operating a dead break network transformer oil disconnect and grounding switch utilizing existing standards, work methods, and tools requires clothing with a recommended minimum effective arc rating of 8 cal/cm^2.

3.3.2 MAG-BREAK TRANSFORMER OIL DISCONNECT AND GROUNDING SWITCH

A small population of installed network transformers is equipped with mag-break switches. A mag-break switch is rated for interrupting the magnetizing current of its network transformer. Two electrical interlocks prevent movement of the switch operating mechanism while the network protector is in the closed position, and prevent switch movement into the ground position while the transformer is energized. The switch is permitted to operate from the closed to open position with the primary circuit energized and the network protector in the open position. If a fault were to occur, the potential for it to be a three phase bolted fault during mag-beak switch operation with the primary circuit energized is high, as the switch is a gang operated three phase switch. The switches reside within a fluid filled, sealed chamber. Currently National Grid does not complete dissolved gas analysis tests on these chambers, resulting in unknown insulating and operating properties of the fluid and switch respectively.

If a fault were to occur on a dedicated network circuit, the fault would be detected by the primary circuit substation breaker instantaneous relaying, causing the substation breaker to open and the circuit's network protectors to open on reverse power clearing the fault. However, a number of the mag-break switches are installed on spot network transformers supplied by non-dedicated circuits which do not have instantaneous relaying and instead apply standard time-overcurrent relaying. This arrangement allowed for the switches to be operated without de-energizing the primary circuit. Standard time-overcurrent relay settings result in a longer duration event compared to instantaneous relaying and a higher incident energy, but still fall within levels typical for an underground system.

The arc flash hazard for work assignments involved with operating a mag-break network transformer oil disconnect and grounding switch utilizing existing standards, work methods, and tools requires clothing with a recommended minimum effective arc rating of 8 cal/cm^2.

3.4 NETWORK TRANSFORMER

Work assignments within the transformer cable termination chamber, the transformer oil disconnect switch chamber, or within the transformer main tank would be completed under a clearance with the network transformer isolated. The network protectors would be switched, and in most cases the network protector doors would have to be opened to establish a secondary air gap between the network protector and collector bus by removing fuses or links.

Examples of work assignments within a network transformer include but are not limited to: transformer oil disconnect maintenance, network transformer tap changing, network transformer testing, network transformer replacement, dissolved gas analysis, and network transformer installation and removal.

Once the transformer is isolated, the arc flash hazard for work assignments within the network transformer requires clothing with a recommended minimum effective arc rating of 8 cal/cm^2.

3.5 SWITCHING NETWORK PROTECTORS

The task of operating a network protector is completed external to the enclosure by operating an external handle. A network protector is rated to interrupt full load current, and internal relays ensure the network protector is not closed into a fault.

The arc flash hazard for work assignments involved with operating a network protector utilizing existing standards, work methods, and tools requires clothing with a recommended minimum effective arc rating of 8 cal/cm^2.

3.6 NETWORK PROTECTOR

3.6.1 WORK ASSIGNMENTS PERFORMED WITH THE PROTECTOR ENCLOSURE DOOR CLOSED

Work assignments related to a network protector which do not involve opening the network protector enclosure, such as an inspection through the portholes or pressurizing the protector enclosure, present a minimal potential for a fault.

The arc flash hazard for work assignments with a network protector that do not require opening the network protector enclosure, and utilizing existing standards, work methods, and tools requires clothing with a recommended minimum effective arc rating of 8 cal/cm^2.

3.6.2 WORK ASSIGNMENTS PERFORMED WITH THE PROTECTOR ENCLOSURE DOOR OPEN

Work assignments within the network protector enclosure using existing work methods and procedures is completed with the network protector in the open position and with both sides of the network protector breaker energized. The potential for self-sustained arcing within a network protector enclosure is high due to the following: confined enclosure; close electrode-to-electrode spacing and geometry, preventing arc elongation leading to higher currents and higher transient recovery voltage; high fault current sources leading to higher arc currents more likely to thermally reignite following current zero; high X/R ratio circuits resulting in higher transient recovery voltage; and high potential for multi-phase faults.

Examples of work assignments within a network protector enclosure include but are not limited to: racking out/racking in the network protector breaker, programming the network protector relay(s), removing/installing internal fuses or links, phasing across an established air gap, diagnostic testing of the network protector breaker, and communicating with the network protector master relay.

Work assignments within a network protector enclosure shall not be completed without an arc flash hazard analysis.

3.7 COLLECTOR BUS

Work assignments on a 480 volt spot network collector (common, parallel) bus using existing work methods and procedures are completed with the bus energized depending on the type of bus construction, the phase-to-phase and phase-to-ground clearances, and the level of insulation. Typically, if the bus is constructed with phase-to-phase and phase-to-ground clearances greater than or equal to 15 inches, then an arc in air will be self-extinguishing after the fault initiator has burned clear or been forced away from the bus by magnetic forces [8]. Where present, bus insulation protects the bus from faults initiated by a metallic object bridging any two or more phases or any phase and ground.

Enclosed, metal clad, bus duct, or other confined bus arrangements have similar characteristics as network protectors which creates a high potential for self-sustained arcing.

Examples of work assignments related to the collector bus include but are not limited to: terminating conductors to the collector bus, insulating the bus, testing the bus, installing and removing the bus or portions of the bus, and installing or removing metering equipment.

Work assignments related to the collector bus shall not be completed without an arc flash hazard analysis.

3.8 SINGLE PHASE, LINE-TO-GROUND WORK ASSIGNMENTS

With a single phase arc, the arc will extinguish briefly and cool at every half cycle. Arcing sustains if the arc restrikes after the current zero crossing. With a three phase fault and two or three arcs, heating is continuous resulting in the arc being more likely to sustain. Industry testing has shown that relatively close electrode-to-electrode spacing and arc confinement results in sustained arcing. However, in all industry tests with line-to-ground fault initiations, the faults cleared quickly in 1.5 cycles or less except when the fault expanded to multiple phases. Industry test results for faults with exposure to only phase to ground faults correspond to clothing with a minimum effective arc rating of 4 cal/cm^2 [9].

Examples of work assignments with line-to-ground exposure include but are not limited to: removing/installing external network protector fuses contained in single phase, non-conducting housings with the network protector in the open position; installing/removing/operating external links contained in single phase, non-conducting housings with the network protector in the open position; removing/installing insulated conductors to the secondary terminals of network protectors with a minimum 3 inch gap between phases and with the network protector in the open position; and operating single pole, phase isolated, non-load break disconnects with the network protector in the open position.

The arc flash hazard for work assignments involved with strictly line-to-ground exposure and utilizing existing standards, work methods, and tools requires clothing with a recommended minimum effective arc rating of 8 cal/cm^2.

4 ARC FLASH HAZARD CALCULATION

As required by the 2012 edition of the NESC, an arc hazard analysis shall be completed for each work assignment within a 480 volt spot network system. A comparison of all available analysis tools for arc flash hazard calculations was completed [10]. Although none of the currently available analysis tools adequately cover all of the scenarios, it was concluded that the IEEE 1584 calculation method was best verified for voltages below 15kV and arc-in-a-box estimations. National Grid's installed network protectors are all enclosed network protectors, requiring arc-in-a-box estimation tools to complete an arc flash hazard analysis.

The analysis of the National Grid 480 volt spot network systems was completed utilizing the IEEE 1584 calculation method [11, 12].

4.1 SYSTEM INSTALLATION DATA COLLECTION

Location specific as-built data is required to complete the necessary arc flash hazard analysis. A vault survey form was created to collect data from the 480 volt network transformers, network protectors, collector buses, and vaults in April of 2011. Appendices were provided to aid in distinguishing between different style installations. The survey was issued to the operations departments by June of 2011. Vault survey information was returned by December 20, 2011.

4.2 DETERMINE THE BOLTED FAULT CURRENTS

The bolted fault current in each spot network system was calculated utilizing only the impedance of the installed transformers and a zero impedance fault. The short lengths of cable or bus installed in the spot network system provide negligible impedance compared to the transformer impedance.
Per specification, network transformers sized 1000kVA and below are to have 5% impedance, and network transformers sized 1500kVA and greater are to have 7% impedance [13]. The manufacturers are allowed a +/- 7.5% tolerance on the specified impedance [14]. A lower calculated bolted fault current will result in a lower calculated arcing current. Lower levels of arcing current typically generate higher levels of incident energy because low arcing current levels are more difficult to detect and clear resulting in a longer event duration. In order to conservatively estimate the resultant arcing current, the maximum allowable transformer impedance was utilized. The calculations for all existing spot network transformer configurations were completed utilizing Mathcad™.
The Mathcad™ file is attached as Appendix A, and a summary of the calculated bolted fault currents is included in Section 4.3, Table 2.

4.3 DETERMINE THE ARC FAULT CURRENTS

The arc fault current depends primarily on the bolted fault current. Particularly for applications lower than 1000 volts, the calculated arc fault current will be less than the calculated bolted fault current due to the arc impedance. The predicted three-phase arcing current is required to determine the operating time for protective devices.

All of the installed National Grid network protectors are enclosed. The "box configuration" arc fault current calculation constant was utilized for the analysis of all network protector work assignments.

480 volts is the predominant system voltage within the National Grid spot network installations. The system voltage in all calculations was assumed to be 480 volts. The resultant difference between a calculation at 460 volts and a calculation at 480 volts is minimal.

A 32 mm gap between conductors was utilized for network protector arc flash analysis as recommended in Table 4 of IEEE 1584, and to be consistent with industry testing [9].

Per the IEEE 1584 standard, a second arc current equal to 85% of the original arc current was calculated in each case. Table 2 below summarizes the calculated bolted fault and arcing currents.

Number of Transformers	Bolted Fault Current Ibf (kA)	Arcing Current Ia (kA)	Arcing Current 85% of Ia (kA)
1-750	16.783	9.693	8.239
2-750	33.567	17.266	14.676
3-750	50.35	24.203	20.573
4-750	67.134	30.757	26.143
1-1000	22.378	12.318	10.47
2-1000	44.756	21.942	18.65
3-1000	67.134	30.757	26.143
4-1000	89.512	39.085	33.222
1-1500	23.976	13.046	11.089
2-1500	47.953	23.239	19.754
3-1500	71.929	32.576	27.69
4-1500	95.905	41.396	35.187
5-1500	119.882	49.852	42.374
1-2000	31.968	16.578	14.092
2-2000	63.937	29.532	25.102
3-2000	95.905	41.396	35.187
4-2000	127.874	52.606	44.715
1-2500	39.96	19.965	16.97
2-2500	79.921	35.564	30.229
3-2500	119.882	49.852	42.374
4-2500	159.842	63.351	53.848

Table 2: Summary of Calculated Bolted Fault and Arcing Currents

4.4 Determine the Duration of the Arcs

The time in seconds an arc is present greatly influences the calculated incident energy. The industry has taken two approaches for determining the maximum duration of an arcing event for calculation purposes. Either a maximum duration of two seconds or the duration for a protective device to operate is used for calculation purposes [9].

4.4.1 Two Second Maximum Duration Assumption

Per IEEE 1584 [11] "It is likely that a person exposed to an arc flash will move away quickly if it is physically possible and two seconds is a reasonable maximum time for calculations." When utilizing the two second duration assumption, incident energies increase with more units in parallel because of the constant duration assumption. A drawback to this assumption in spot network installations is if the conditions are cramped, then voluntary or involuntary attempts by the worker to move away from the flash may not be possible.

The two second assumption was not applied in the National Grid arc flash hazard analysis.

4.4.2 Protective Device Clearing Time Assumption

The ability and time required to clear a fault depends on the fault location, the arcing current magnitude, and the anticipated method of clearing the fault. The arc flash hazard analysis of the National Grid 480 volt spot network systems was completed utilizing a maximum time duration equal to the lesser of one of the following:

- 76 seconds, the time documented in the National Grid "Code Blue and Emergency Rescue Techniques" video to complete a non-entry manhole rescue utilizing the winch method.
- The time required for protective devices to detect and isolate the fault.

The characteristics of various faults, including duration, can be categorized by zones.

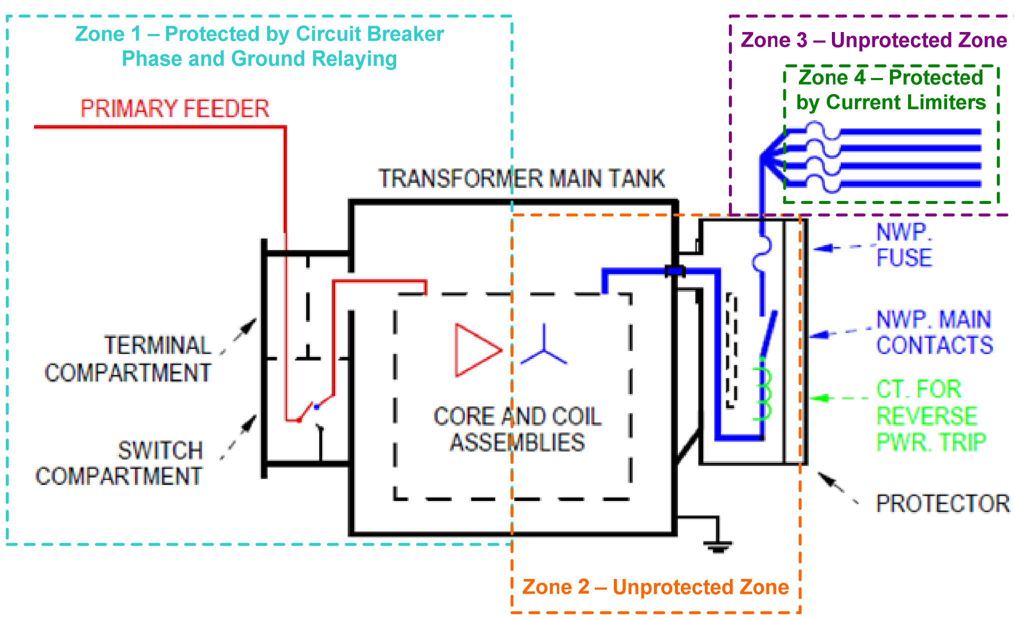

Figure 1: Possible Fault Location Zones

Figure 1 Notes:

(1) Original drawing of network unit by Dave Smith of Siemens PTI, April 2006.
(2) Zones added by Dan Mungovan of National Grid, January 2012

Zone 1

If a fault occurs on the primary circuit, within the primary circuit termination chamber, within the network transformer oil disconnect and grounding switch, or within the network transformer primary winding; it is isolated by opening of the primary circuit breaker at the substation and the network protectors supplied by the faulted circuit.

Zone 2

A fault within the network transformer secondary windings, secondary terminal connections to the network protector, or network protector enclosure may be cleared from the secondary network system through the opening of the network protector or network protector fuses. However, the fault will not be cleared from the primary circuit unless a manual operation is completed to clear the fault, the fault burns clear, or the fault progresses far enough into the high voltage windings of the transformer to be detected by the primary circuit relays. All of these options to clear the primary circuit can take considerable time and will result in extensive damage to the assets and a calculated arc flash hazard of long duration.

Per industry research [9] "If arcs last as long as 0.4 seconds or more, significant damage will occur to the bus bars and other hardware within the (network protector) enclosure. The entire enclosure will be enveloped in hot ionized gas. Restrikes may occur on the load side of the (internal) fuses even if the fuses operate." A fault within this zone, even if initially cleared from the secondary system, will restrike to the secondary network system and be a long duration fault.

Per industry testing [6] "No matter where the fault originates (within the network protector enclosure), test results on 480-V network protectors and on other equipment have shown the fireball will cause the fault to expand and likely include both sides of the circuit breaker."

For calculation purposes it is assumed that the position of the network protector breaker does not influence the calculated incident energy, because if it is in the open position before the enclosure is opened, and should a fault occur while the primary circuit is energized then the fault will not be cleared quickly and the fault will expand or restrike to the secondary network system.

Zone 2 is considered an unprotected zone.

Zone 3

A fault on the collector bus or on the load side of the network protector fuses will either be cleared by the opening of all spot network protectors connected to the collector bus, by the blowing of all network protector fuses connected to the collector bus, or by burning clear. However, network protectors do not inherently have the capability to detect faults on the load side of the network protector breaker.

The main purpose of a network protector fuse is to back-up the network protector breaker if it fails to open for a fault on the high side of the network transformer. Per industry research [8] "A comparison of the time-current characteristics of the network protector fuse with the thru fault protection curves of the network transformer, shows that the fuse protects the transformer, both thermally and mechanically, for currents which are greater than about 3 to 5 times transformer full load current." Network protector fuses will not detect arcing faults because arcing faults typically have currents less than transformer full load current and they tend to generate high arcing currents for short intervals, extinguish and then reignite [15]. Both current limiting and standard fuses, including network protector fuses, function best for high-current sustained faults.

Additional protective measures such as ground fault protection or heat detection must be employed in order to detect a fault on the load side of the network protector breaker and then initiate a trip and lockout of the network protectors in the spot network. Absent additional protective measures, zone 3 is considered an unprotected zone.

Zone 4

If the fault originates within a set of cables connecting a network protector to the collector bus and if the cables have current limiting limiters installed on both ends, then the fault will be cleared quickly and with minimal arc flash hazard.

4.4.3 NETWORK PROTECTOR FUSE ASSIGNMENT

A network protector is a nameplate device, meaning it can not be overloaded beyond its nameplate rating. As network transformer specifications have evolved, the specified overload capabilities of network transformers have increased. An example is a 1500kVA transformer with a secondary voltage of 480Y/277 volts. Historically a 2500A, 480Y/277 volt network protector would be paired with a 1500kVA transformer. However, National Grid's network contingency design criteria may allow transformers to be loaded to 140% of nameplate rating [16]. A new 1500kVA transformer would therefore be paired with a 2825A, 480Y/277 volt network protector. As noted above, network protector fuses are sized to protect the network transformer. As the network protector rating has increased, so has the network protector fuse size, which means similar sized network transformers within the National Grid system will have different size protectors and fuses depending on the specifications in place at the time of installation. Based on current National Grid standards [16], Table 3 below lists the assumed network protector ratings for each network transformer size for the purposes of completing the arc flash analysis.

Current Value at 480Y/277 Volts	Network Transformer Size				
	750 kVA	1000 kVA	1500 kVA	2000 kVA	2500 kVA
Nameplate current (A)	902.1	1202.8	1804.2	2405.6	3007
140% of Nameplate (A)	1263	1683.9	2525.9	3367.9	4209.8
Network Protector Rating (A)	1600	1875	2825	3500	4500

Table 3: Assumed Network Protector Rating for each Network Transformer Size

Table 4 below lists the assumed network protector fuses for each network transformer size for the purposes of completing the arc flash analysis. The fuses in Table 4 are typical of the wide variety used in National Grid's 480 volt spot network systems, as indicated by the results of the 2011 survey (see section 4.1).

Network Protector Fuse	Network Transformer Size				
	750 kVA	1000 kVA	1500 kVA	2000 kVA	2500 kVA
Cu Link	NWP-5	NWP-5	NWP-3	-	-
S Fuse	Do not use	Do not use	Do not use	Do not use	Do not use
Y/Z Fuse	22.5	25	37.5	50	50
Non-Laminated Alloy	NF-4	NF-5	NF-10	NF-10	-
Alloy Standard Speed	1300551	14A5795G06	1615572	15A4106G04	-
Alloy Lag Speed	1300579	-	-	405D312G03	-
Eaton NPL	1300A	1875A	2825A	3500A	5000A
Ferraz Shawmut A4BY	A4BY1600	A4BY2000	A4BY3000	A4BY4000	A4BY5000
Bussman KTU	1600	2000	3000	4000	5000
Bussman KRP-C	1600	2000	3000	4000	5000

Table 4: Assumed Network Protector Fuse for each Network Transformer Size

Table 4 Notes:

(1) S-style fuses, per the manufacturer, are not to be applied on 480 volt systems.

(2) Some style fuses do not have an appropriately rated fuse for each network transformer size.

4.4.4 Estimated Network Protector Fuse Arcing Time Durations

Plotting the arcing currents on the manufacturer's network protector fuse time current curves produced the network protector fuse arcing time results in Table 5 through Table 9.

Arcing Current	Network Protector Fuse	Arcing Time (Seconds)			
		1-750kVA	2-750kVA	3-750kVA	4-750kVA
100% Ia (kA)	Cu Link	0.8	0.2	0.11	0.1
	Y/Z Fuse	2.2	0.65	0.3	0.2
	Non-Laminated Alloy	17	7	4	4
	Alloy Standard Speed	5.6	2.2	1.5	1
	Alloy Lag Speed	15	6	3	2
	Eaton NPL	0.3	0.035	0.01	0.01
	Ferraz Shawmut A4BY	1.2	0.05	0.01	0.01
	Bussman KTU	1	0.02	0.01	0.01
	Bussman KRP-C	1.77	0.09	0.01	0.01
85% of Ia (kA)	Cu Link	6	0.4	0.19	0.1
	Y/Z Fuse	4	0.85	0.4	0.25
	Non-Laminated Alloy	30	8	5.5	4
	Alloy Standard Speed	10	3	1.9	1.4
	Alloy Lag Speed	25	7	4	2.5
	Eaton NPL	0.5	0.05	0.02	0.01
	Ferraz Shawmut A4BY	3.04	0.12	0.02	0.01
	Bussman KTU	2.5	0.04	0.01	0.01
	Bussman KRP-C	4.3	0.2	0.03	0.01

Table 5: Summary of Network Protector Fuse Arcing Times – 750kVA Transformers

Arcing Current	Network Protector Fuse	Arcing Time (Seconds)			
		1-1000kVA	2-1000kVA	3-1000kVA	4-1000kVA
100% Ia (kA)	Cu Link	0.5	0.13	0.1	0.1
	Y/Z Fuse	2.6	0.55	0.25	0.15
	Non-Laminated Alloy	19	7	1	1
	Alloy Standard Speed	10	3.5	1.8	1.5
	Alloy Lag Speed	-	-	-	-
	Eaton NPL	0.5	0.05	0.016	0.01
	Ferraz Shawmut A4BY	0.88	0.039	0.01	0.01
	Bussman KTU	1.7	0.03	0.01	0.01
	Bussman KRP-C	2.4	0.1	0.01	0.01
85% of Ia (kA)	Cu Link	0.8	0.12	0.1	0.1
	Y/Z Fuse	4	0.8	0.35	0.22
	Non-Laminated Alloy	25	8.5	1	1
	Alloy Standard Speed	14	4.2	2.7	1.7
	Alloy Lag Speed	-	-	-	-
	Eaton NPL	1	0.1	0.04	0.015
	Ferraz Shawmut A4BY	2.1	0.09	0.015	0.01
	Bussman KTU	4	0.08	0.01	0.01
	Bussman KRP-C	5	0.3	0.03	0.01

Table 6: Summary of Network Protector Fuse Arcing Times –1000kVA Transformers

Arcing Current	Network Protector Fuse	Arcing Time (Seconds)				
		1-1500kVA	2-1500kVA	3-1500kVA	4-1500kVA	5-1500kVA
100% Ia (kA)	Cu Link	2	0.5	0.25	0.15	0.1
	Y/Z Fuse	4.5	1.2	0.5	0.35	0.2
	Non-Laminated Alloy	100	29	8	4	1.5
	Alloy Standard Speed	50	14	7	4	3
	Alloy Lag Speed	-	-	-	-	-
	Eaton NPL	7	0.28	0.08	0.03	0.015
	Ferraz Shawmut A4BY	6.7	0.29	0.046	0.013	0.01
	Bussman KTU	10	0.43	0.03	0.013	0.01
	Bussman KRP-C	25	0.9	0.13	0.04	0.02
85% of Ia (kA)	Cu Link	3	0.65	0.3	0.2	0.13
	Y/Z Fuse	7	1.6	0.7	0.45	0.33
	Non-Laminated Alloy	200	38	9	5	4
	Alloy Standard Speed	90	18	8	6	3.9
	Alloy Lag Speed	-	-	-	-	-
	Eaton NPL	10	0.3	0.14	0.05	0.027
	Ferraz Shawmut A4BY	16	0.7	0.11	0.03	0.011
	Bussman KTU	20.7	1.27	0.096	0.019	0.011
	Bussman KRP-C	61	2.36	0.32	0.09	0.04

Table 7: Summary of Network Protector Fuse Arcing Times –1500kVA Transformers

Arcing Current	Network Protector Fuse	Arcing Time (Seconds)			
		1-2000kVA	2-2000kVA	3-2000kVA	4-2000kVA
100% Ia (kA)	Cu Link	-	-	-	-
	Y/Z Fuse	6	1.5	0.8	0.5
	Non-Laminated Alloy	30	8	4.5	1.5
	Alloy Standard Speed	40	10	6	3.8
	Alloy Lag Speed	30	9	6	4
	Eaton NPL	6	0.6	0.21	0.08
	Ferraz Shawmut A4BY	25	1.08	0.17	0.054
	Bussman KTU	43	1.02	0.07	0.02
	Bussman KRP-C	54	1.12	0.17	0.06
85% of Ia (kA)	Cu Link	-	-	-	-
	Y/Z Fuse	9	2.3	1.1	0.68
	Non-Laminated Alloy	70	10	6	3.5
	Alloy Standard Speed	60	17	8	5
	Alloy Lag Speed	50	15	7	5
	Eaton NPL	28	1.4	0.4	0.15
	Ferraz Shawmut A4BY	61	2.64	0.42	0.11
	Bussman KTU	91	2.3	0.31	0.035
	Bussman KRP-C	100	3.56	0.41	0.12

Table 8: Summary of Network Protector Fuse Arcing Times –2000kVA Transformers

Arcing Current	Network Protector Fuse	Arcing Time (Seconds)			
		1-2500kVA	2-2500kVA	3-2500kVA	4-2500kVA
100% Ia (kA)	Cu Link	-	-	-	-
	Y/Z Fuse	4	1.1	0.5	0.33
	Non-Laminated Alloy	-	-	-	-
	Alloy Standard Speed	-	-	-	-
	Alloy Lag Speed	-	-	-	-
	Eaton NPL	25	1.5	0.5	0.22
	Ferraz Shawmut A4BY	27.6	1.19	0.19	0.06
	Bussman KTU	64	1.56	0.13	0.02
	Bussman KRP-C	50.44	1.88	0.1	0.05
85% of Ia (kA)	Cu Link	-	-	-	-
	Y/Z Fuse	5	1.5	0.75	0.47
	Non-Laminated Alloy	-	-	-	-
	Alloy Standard Speed	-	-	-	-
	Alloy Lag Speed	-	-	-	-
	Eaton NPL	50	2.8	0.8	0.35
	Ferraz Shawmut A4BY	67	2.89	0.46	0.12
	Bussman KTU	138	3.67	0.53	0.06
	Bussman KRP-C	114	6.15	0.47	0.08

Table 9: Summary of Network Protector Fuse Arcing Times –2500kVA Transformers

4.4.5 CABLE CURRENT LIMITING LIMITER ARCING TIME DURATIONS

Table 10 below lists the assumed number of cable sets for each network transformer size for the purposes of completing the arc flash analysis.

Cable Size	Network Transformer				
	750 kVA	1000 kVA	1500 kVA	2000 kVA	2500 kVA
500 Cu kcmil	4-500	4-500	5-500	6-500	8-500
750 Cu kcmil	-	-	4-750	5-750	6-750

Table 10: Assumed Number of Cable Sets for each Network Transformer Size

Conventional limiters should not be applied to 480Y/277 volt systems, because the gap which is created when the limiter clears may not be large enough to prevent a restrike.

Current limiting limiters such as the Ferraz-Shawmut CP style limiter should be used on 480Y/277 volt systems. They are fast-acting and capable of producing a large enough gap preventing restrike in 480Y/277 volt systems. Plotting the arcing currents on the manufacturer's current limiting limiter time current curves produced the duration results in Table 11 through Table 15 below.

Arcing Current	Cable Size	Arcing Time (Seconds)			
		1-750kVA	2-750kVA	3-750kVA	4-750kVA
100% Ia (kA)	4s 500 - CP	13	0.7	0.2	0.09
	750 - CP	-	-	-	-
85% of Ia (kA)	4s 500 - CP	30	2	0.4	0.17
	750 - CP	-	-	-	-

Table 11: Summary of Current Limiting Limiter Arcing Times –750kVA Transformers

Arcing Current	Cable Size	Arcing Time (Seconds)			
		1-1000kVA	2-1000kVA	3-1000kVA	4-1000kVA
100% Ia (kA)	4s 500 - CP	3.5	0.3	0.09	0.04
	750 - CP	-	-	-	-
85% of Ia (kA)	4s 500 - CP	8	1.6	0.17	0.07
	750 - CP	-	-	-	-

Table 12: Summary of Current Limiting Limiter Arcing Times –1000kVA Transformers

Arcing Current	Cable Size	Arcing Time (Seconds)				
		1-1500kVA	2-1500kVA	3-1500kVA	4-1500kVA	5-1500kVA
100% Ia (kA)	5s 500 - CP	8	0.6	0.2	0.08	0.04
	4s 750 - CP	8	0.6	0.2	0.08	0.04
85% of Ia (kA)	5s 500 - CP	30	1	0.3	0.14	0.07
	4s 750 - CP	30	1	0.3	0.14	0.07

Table 13: Summary of Current Limiting Limiter Arcing Times –1500kVA Transformers

Arcing Current	Cable Size	Arcing Time (Seconds)			
		1-2000kVA	2-2000kVA	3-2000kVA	4-2000kVA
100% Ia (kA)	6s 500 - CP	8	0.4	0.14	0.06
	5s 750 - CP	8	0.4	0.14	0.06
85% of Ia (kA)	6s 500 - CP	20	1	0.25	0.1
	5s 750 - CP	20	1	0.25	0.1

Table 14: Summary of Current Limiting Limiter Arcing Times –2000kVA Transformers

Arcing Current	Cable Size	Arcing Time (Seconds)			
		1-2500kVA	2-2500kVA	3-2500kVA	4-2500kVA
100% Ia (kA)	8s 500 - CP	13	0.8	0.2	0.07
	6s 750 - CP	8.5	0.5	0.17	0.07
85% of Ia (kA)	8s 500 - CP	30	1.5	0.35	0.15
	6s 750 - CP	20	1.3	0.27	0.11

Table 15: Summary of Current Limiting Limiter Arcing Times –2500kVA Transformers

4.4.6 Heat Detection System

The energy in an arcing fault generates a tremendous amount of heat in an extremely short time [15]. A heat sensing system located within network protectors, near collector buses, near service takeoffs, and near cabling can be used effectively to detect arcing faults. Heat sensing equipment can be installed in every spot network vault, because it is not dependent on the style of equipment installed within the vault to be protected.

However, the heat sensing equipment must be positioned in close proximity to the protected equipment to ensure quick detection. Typically heat probes installed within a network protector are installed on the inside of the protector enclosure door. During work assignments within the enclosure, the door will be swung open between 90° and 180°. At these distances, the effectiveness of the heat detection system is greatly reduced, because the probes are no longer positioned closely to the potential acing fault locations.

The heat detecting elements which are utilized to protect a collector bus are typically installed around the perimeter of the collector bus arrangement. The heat sensor would be well-positioned for arcing faults on the outer phases, but would not easily detect arcing faults on the interior phases.

As a result, heat detection systems were not included as a potential protective device for the arc flash hazard analysis of the National Grid 480 volt spot network systems.

4.4.7 GROUND FAULT DETECTION SYSTEM

All of the National Grid 480 volt spot network systems are operated with solidly grounded neutrals. During normal operation, there is no significant flow of zero sequence current (current in the ground path). Faults involving ground will produce distinct ground-fault current [17]. Therefore monitoring the zero sequence current provides a means of detecting all circuit faults involving ground, whether arcing or bolted.

The preferred ground break relay installed within National Grid network systems is the General Electric TGSR12™ relay. The TGSR12™ relay has an adjustable time delay of 0.03 seconds (instantaneous) to 1.0 seconds, and an adjustable pickup range of 100-1200 amperes. Most importantly, due to the highly intermittent and erratic nature of arcing ground faults, the TGSR12™ relay has a 7 second memory circuit which integrates intermittent faults with time [17]. Rather than a typical ground fault relay whose time delay circuits are reset with every missing cycle during an arcing fault, the TGSR12™ relay's memory sums the time increments of intermittent ground faults above the pickup point and generates a trip signal after the preset time delay.

Many ground fault detection scheme arrangements are possible. Typically ground fault current sensors are installed at every point the neutral is grounded. In order to protect all of the possible zones within a spot network system, the network transformers must have fully insulated XO bushings brought through the network transformer case. This arrangement allows for current transformers to be installed at the point the transformer neutral is grounded. Legacy network transformers which have solidly grounded neutrals can not be effectively protected by ground fault protection schemes.

Ground fault protection schemes require coordination with the customer's protective settings, and increase in complexity if the network system's transformers are grounded wye on the primary and grounded wye on the secondary or if generation has been interconnected to the spot network system.

For the purposes of calculating the arc flash hazard, it was assumed that all ground fault relays were set with a pickup of 1200 amperes and a time delay of 0.5 seconds. Total arcing time duration with a ground fault protection scheme is 0.64 seconds and was calculated as the sum of the following:

- Ground break relay = 0.5 seconds
- Lock out relay = 0.015 seconds [18]
- Latching relay = 0.025 seconds [19]
- Network Protector Open Time = 0.1 seconds

4.5 Determine the Distance from the Arc

Per IEEE 1584 [11], "Arc flash protection is always based on the incident energy level on the person's face and body at the working distance, not the incident energy on the hands or arms." The majority of utilities utilize a working distance of 18 inches, but some use 24 inches. Industry testing has shown that incident energies are approximately 35% lower at 24 inches than at 18 inches [9].

Specifically for network protectors, a number of bolts need to be loosened in order to rack out a network protector breaker. The bolts are in different locations within the enclosure and may require a variety of body positions in order to get the bolts loosened. Because of this, and based on field observations and discussions with operations personnel, the National Grid arc flash hazard analysis of 480 volt spot network systems was completed utilizing a distance of 18 inches.

4.6 Determine the Incident Energy

The incident energy was calculated for each of the 330 installations within the National Grid network systems. Per IEEE 1584, an incident energy value is calculated for both the 100% arcing current and the 85% arcing current. The greater resultant incident energy of the two is utilized. The incident energy calculations for all existing spot network transformer configurations were completed utilizing Mathcad™. The Mathcad™ file is attached as Appendix B.

4.6.1 Incident Energy with the Network Transformer Energized

Existing procedures allow for the network protector to be energized while the network protector enclosure is open. As noted in section 4.4.2, this may result in a fault in zone 2 which will have a long duration and cause extensive damage.

When the network transformer is energized, a 76 second duration was utilized for all calculations to determine the incident energy within the network protector enclosure. Appendix C lists the calculated incident energy values for each installation by division and network system. The calculated incident energy values are between 1,547 cal/cm^2 and 11,770 cal/cm^2.

4.6.2 Incident Energy with the Network Transformer De-Energized

When the network transformer is de-energized, a protective device may clear the fault. For calculations in which the network transformer is de-energized and all other spot network transformers are energized and their associated network protectors are closed, the duration was determined by which protective device would detect and isolate the fault first. Appendix D lists the calculated incident energy values for each installation by division and network system. Because the lowest allowable arc rating for clothing per National Grid's safety policy is clothing with a minimum effective arc rating of 8 cal/cm^2, for instances in which the calculated values were less than 8 cal/cm^2, the result was listed as 8 cal/cm^2. The calculated incident energy values are between 8 cal/cm^2 and 377 cal/cm^2.

5 CONCLUSIONS

The arc flash hazard for work assignments within a 208 volt network vault utilizing existing standards, work methods, and tools requires clothing with a minimum effective arc rating of 8 cal/cm^2 per National Grid's safety policy [4].

In 480 volt spot network systems, the arc flash hazard level for many of the work assignments using existing standards, work methods, and tools requires clothing with a minimum effective arc rating of 8 cal/cm^2. However, certain work assignments performed on the collector bus and within the network protector enclosure result in a calculated arc flash hazard level at the majority of National Grid's 480 volt spot network systems that exceeds effective ratings of commercially-available arc flash rated clothing systems (100 cal/cm^2). These are as follows:

- Work assignments on a 480 volt spot network collector bus result in calculated incident energy levels in a range of 1,547 cal/cm^2 to11,770 cal/cm^2.
- Work assignments with the network protector enclosure open and with all spot network transformers energized result in calculated incident energy levels in a range of 1,547 cal/cm^2 to 11,770 cal/cm^2.
- Work assignments performed with the network protector door open, and with the transformer supplying the network protector involved in the work assignment de-energized, result in a reduction of calculated incident energy levels to a range of 8 cal/cm^2 to 377 cal/cm^2.
    - 34 network protector installations (10% of the installed units) have calculated incident energy values greater than 100 cal/cm^2.

Certain generalizations can be made with regard to the various protective devices and schemes in place in National Grid's existing 480 volt spot network systems:

- Installations with ground fault detection systems consistently resulted in the lowest incident energy values.
- Current limiting network protector fuses produced smaller incident energy values only when more transformers were in-service at the time of the fault. Network protector fuses may not interrupt as expected. Testing [20] has shown differences between fuse characteristics and manufacturer's fuse curves. Clearing time is dependent on fuse characteristics. The higher the bolted and arcing fault current values, the faster the current limiting fuses performed. At low levels of current, these fuses performed poorly.
- At low levels of current, the Y/Z copper fuses performed better than the standard speed alloy fuses and the current limiting fuses. Network protector fuses may not interrupt as expected. Testing [20] has shown differences between fuse characteristics and manufacturer's fuse curves. Clearing time is dependent on fuse characteristics. Similar to the current limiting fuses, a Y/Z network protector fuse cleared faster as the bolted and arcing fault currents increased.
- Sets of cable with current limiting limiters will clear faults faster than any of the network protector fuses, but per the survey their application has not been widespread.
- Heat detection systems were not included in the arc flash analysis, but their ability to be installed in all vaults regardless of the equipment is of significance. Heat detection is a viable option for reducing the number of 480 volt faults which lead to burn-down of spot network systems consisting of network transformers with solidly grounded XO bushings.

6 RECOMMENDATIONS FOR 480 VOLT SPOT NETWORK SYSTEMS

The following recommendations are made as a result of the arc flash hazard analysis for National Grid's 480 volt spot network systems. In all cases, all workers shall wear a clothing system rated for the calculated incident energy for the work assignment.

6.1 LONG-TERM RECOMMENDATIONS

- Update relevant National Grid standards, work methods, and tools to address the arc flash hazard levels identified in this study.

- Mag-break transformer oil disconnect and grounding switches should not be used to de-energize a network transformer. A primary switch suitable for the application should be used. Alternatively, the entire circuit can be de-energized using the station breaker before isolating the individual transformer with the transformer oil disconnect and grounding switch.

- Existing installations without ground fault detection systems and having transformers with fully insulated neutral bushings shall be equipped with such a system where practical.

- For all work assignments that require a network protector enclosure to be opened, a network protector shall first be de-energized from both its network transformer and the secondary network system. This shall be accomplished by use of equipment specific for the purpose (such as primary switches and secondary switches or isolation links).
  - Where practical for existing installations, retrofit and install engineering controls that will reduce the calculated incident energy to a level less than 8 cal/cm^2. These controls shall include an appropriate means to de-energize each network transformer from the primary circuit and to de-energize each network protector from the secondary network system.
  - For all new installations, include engineering controls as part of the initial design that will reduce the calculated incident energy to a level less than 8 cal/cm^2. These controls shall include an appropriate means to de-energize each transformer from the primary circuit, to de-energize each network protector from the secondary network system, and to optimally protect and isolate faults in all zones.

- For all work assignments on a 480 volt spot network collector bus, the collector bus shall be de-energized unless the work assignment strictly involves line-to-ground exposure.
  - Collector bus work assignments involved with strictly line-to-ground exposure may be completed with the collector bus energized as the calculated incident energy level is less than 8 cal/cm^2.

- Spot network protection systems (including, but not limited to, ground fault detection and heat detection) in a vault with primary interrupting switches shall be designed to trip the vault's primary fault interrupting switches rather than the vault's network protectors. The calculated incident energy levels and subsequent equipment damage will decrease when the vault's primary fault interrupting switches are tripped because:
  - the primary fault interrupting switches will clear 7 cycles faster than majority of the network protectors
  - all potential fault zones will be completely de-energized

6.2 INTERIM MEASURES

Until the recommendations listed in Section 6.1 are fully implemented, the following measures are recommended to insure protection from identified arc-flash hazards of National Grid's 480 volt spot network systems. In all cases, all workers shall wear a clothing system rated for the calculated incident energy for the work assignment.

- It is recommended that the network transformer be de-energized for all work assignments that require the enclosure of a 480 volt network protector be opened. This may be accomplished by either:
  - Opening the primary circuit station breaker
  - Opening a primary interrupting switch which is fully-rated for the fault current levels of the installation

- It is recommended that the 480 volt network protector be de-energized from the secondary network system before the enclosure is opened. This may be accomplished only through isolation practices that strictly limit the exposure to 277 volts line-to-ground by either:
  - Removing externally mounted current limiting fuses housed in non-conducting, phase-isolated housings – one phase at a time, example CM-52 or CMD protectors.
  - Removing externally mounted current limiting fuses from insulated bus bars – one phase at a time.
  - Removing insulated conductor terminations from a protector terminal – one phase at a time.

- For work assignments that require opening a network protector door, where the network protector can not be isolated from the secondary network system using isolation practices that strictly limit the exposure to 277 volts line-to-ground, and where the calculated incident energy levels exceed the ratings of the available arc-flash clothing system, then it is recommended the spot network system be de-energized before the enclosure is opened. This shall be accomplished by switching all spot network protectors to the open position, and by de-energizing the network transformer associated with the network protector enclosure to be opened.

- For all work assignments on a 480 volt spot network collector bus, it is recommended the collector bus be de-energized unless the work assignment only involves line-to-ground exposure.
  - Collector bus work assignments involved with strictly line-to-ground exposure may be completed with the collector bus energized as the calculated incident energy level is less than 8 cal/cm^2.

6.3 Recommended New Equipment

6.3.1 Isolation from the Secondary Network System

The preferred method for isolating a 480 volt network protector from the secondary network system is by opening single pole, phase isolated, hook switch, no load disconnect switches. The following disconnects have been set up as National Grid preferred standard items:

- 2000 ampere, three phase, no load, hook stick operated switch with individually operated poles, phase barriers, and ground bus.
  - For use with network protectors rated 1875 amperes or less within a dry environment.

- 4000 ampere, three phase, no load, hook stick operated switch with individually operated poles, phase barriers, and ground bus.
  - For use with network protectors rated 2500 amperes to 3500 amperes within a dry environment

- 5000 ampere, outdoor disconnect switch three phase assembly, no load, hook stick operated switch with individually operated poles, phase barriers, and ground ball stud.
  - For use with network protectors rated 4500 amperes within a dry environment.

For submersible environments, the installation of a Richards external disconnect link housing is the preferred method for isolating a 480 volt network protector from the secondary system. Each phase isolated housing is non-conducting, and the link inside is operated through the use of a standard T wrench to loosen captive bolts. The unit mounts on the network protector terminals and comes in two sizes: a small terminal unit for small frame protectors rated 1875 amperes or less, and a large terminal unit for network protectors rated 2500 amperes to 3500 amperes.

  - A Richards housing can also be used for the installation of current limiting fuses within the housing.

  - Network protectors rated 4500 amperes at this time will require the housing suitable for installation of the appropriate current limiting fuses. External disconnect links are not available with a 4500 ampere rating.

6.3.2 ISOLATION FROM THE PRIMARY CIRCUIT

The preferred method for de-energizing a 480 volt network transformer from the primary circuit is by opening a rated three phase, vacuum fault interrupter installed on the primary circuit upstream from cable terminations on the network transformer.

A primary fault interrupting switch provides the following benefits:

- A network transformer can be de-energized without opening the primary circuit station breaker, which results in an entire circuit of network transformers being out of service and puts the network system at an N-1 contingency.
- The switch will significantly reduce the switching time and cost of each network protector work assignment that requires the network protector enclosure to be opened.
- The switch provides a location for visible grounds to be installed.
- The switch provides superior protection for the unprotected zone as instantaneous relay settings can be installed for each specific application.
- The switch will consistently open faster than most network protectors
    - The preferred switch opens in 3 cycles
    - The CM-52 network protector opens in 2 cycles
    - The CM-22, CMD, MG-8 and other legacy network protectors have opening times dependent on the condition and maintenance of the unit; however, a well-maintained unit should open in 6-10 cycles.
- The switch can be installed such that the enhanced protective schemes can trip and lockout the switch rather than the network protectors, resulting in complete de-energization of the spot network vault.

Given the range of primary voltages and fault current levels available within the National Grid system, the Elastimold NMVI3 fault interrupting switch is the preferred device. However, the symmetrical and asymmetrical interrupting capability must be strictly adhered to in every installation. The published capabilities for the Elastimold NMVI3 at the time of this study are as follows:

- 15.5 kV – Symmetrical = 20 kA, Asymmetrical = 32 kA
- 27 kV – Symmetrical = 12.5 kA, Asymmetrical = 20 kA
- 35 kV – Symmetrical = 25 kA, Asymmetrical = 40 kA

6.4 ESTIMATED COST FOR RECOMMENDATIONS

The 330 National Grid 480 volt installations are approximately 2% pad mounted, 39% building vault, and 59% submersible. The total estimated study grade cost for installing secondary isolation equipment on each 480 volt network protector is $4,905,000. Table 16 lists the estimated study grade costs for installing secondary network isolation equipment on each 480 volt network protector by network system.

Division	Network System	Number of Network Protectors	Study Grade Cost Secondary Isolation
New England North	Lynn	3	$0 - Vault to be Removed
New England North	Worcester	37	$555,000.00
New England North Total			$555,000.00
New England South	Brockton	2	$30,000.00
New England South	Pawtucket	0	$0.00
New England South	Providence	32	$480,000.00
New England South Total			$510,000.00
New York East	Albany	26	$390,000.00
New York East	Albany (34.5kV)	29	$435,000.00
New York East	Glens Falls	0	$0.00
New York East	Schenectady	9	$135,000.00
New York East	Troy	2	$30,000.00
New York East Total			$990,000.00
New York Central	Cortland	0	$0.00
New York Central	Syracuse (Ash)	30	$450,000.00
New York Central	Syracuse (Temple)	45	$675,000.00
New York Central	Utica	8	$120,000.00
New York Central	Watertown	2	$30,000.00
New York Central Total			$1,275,000.00
New York West	Buffalo (Broadway)	0	$0.00
New York West	Buffalo (Elm)	105	$1,575,000.00
New York West	Niagara Falls	0	$0.00
New York West Total			$1,575,000.00

Table 16: Estimated Study Grade Cost for Secondary Network Isolation by Network System

The total estimated study grade cost for installing primary isolation equipment on each 480 volt network transformer is $15,696,000. Table 17 lists the estimated study grade costs for installing primary fault interrupting switches for de-energizing 480 volt network transformers by network system.

Division	Network System	Number of Network Protectors	Study Grade Cost Primary Isolation
New England North	Lynn	3	$0 - Vault to be Removed
New England North	Worcester	37	$1,776,000.00
New England North Total			$1,776,000.00
New England South	Brockton	2	$96,000.00
New England South	Pawtucket	0	$0.00
New England South	Providence	32	$1,536,000.00
New England South Total			$1,632,000.00
New York East	Albany	26	$1,248,000.00
New York East	Albany (34.5kV)	29	$1,392,000.00
New York East	Glens Falls	0	$0.00
New York East	Schenectady	9	$432,000.00
New York East	Troy	2	$96,000.00
New York East Total			$3,168,000.00
New York Central	Cortland	0	$0.00
New York Central	Syracuse (Ash)	30	$1,440,000.00
New York Central	Syracuse (Temple)	45	$2,160,000.00
New York Central	Utica	8	$384,000.00
New York Central	Watertown	2	$96,000.00
New York Central Total			$4,080,000.00
New York West	Buffalo (Broadway)	0	$0.00
New York West	Buffalo (Elm)	105	$5,040,000.00
New York West	Niagara Falls	0	$0.00
New York West Total			$5,040,000.00

Table 17: Estimated Study Grade Cost for Primary Isolation by Network System

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APPENDIX A

Mathcad™ Bolted Fault Calculation Worksheet

"SpotNetworkFault.xmcd"

MathCad File: SpotNetworkFault.xmcd

This file calculates the maximum symmetrical three phase short circuit current available in a 480 volt spot network system.

Note: 500kVA transformers are included for completeness; however, there are presently no 500kVA 480Y/277 volt network transformers installed in National Grid's network systems.

Assumptions:

- IEEE C57.12.40
  - 300kVA - 1000kVA Transformers = 5.0% Impedance
  - 1500kVA - 2500kVA Transformers = 7.0% Impedance
- IEEE C57.12.00 allows for +/- 7.5% tolerance on manufacturer's impedance
- Assume infinite high side bus
- Assume zero impedance fault
- Assume impedance of transformers is mostly reactive
- Assume impedance which results in the lowest available fault current
- Lower fault current calculates a lower arc current, slower clear time, more conservative

$$Zt5 := 0.05 + 0.05\cdot(0.075) = 0.054 \qquad Zt7 := 0.07 + 0.07\cdot(0.075) = 0.075$$

$$Sbase := 100\cdot 10^{6}\ \text{VA} \qquad Vbase := 480\ \text{Volts} \qquad Ibase := \frac{Sbase}{\sqrt{3}\cdot Vbase} = 120281.306\ \text{Amperes}$$

500kVA Transformers

$$Z500 := Zt5\cdot\left(\frac{Sbase}{0.5\cdot 10^{6}}\right) = 10.75(\ \text{pu}$$

1-500kVA Transformer

$$Z1\_500 := \left(\frac{1}{1}\right)\cdot Z500 = 10.75(\ \text{pu} \qquad I1\_500 := \frac{Ibase}{Z1\_500} = 11188.959\ \text{Amperes}$$

2-500kVA Transformers

$$Z2\_500 := \left(\frac{1}{2}\right)\cdot Z500 = 5.375\ \text{pu} \qquad I2\_500 := \frac{Ibase}{Z2\_500} = 22377.917\ \text{Amperes}$$

3-500kVA Transformers

$$Z3\_500 := \left(\frac{1}{3}\right)\cdot Z500 = 3.583\ \text{pu} \qquad I3\_500 := \frac{Ibase}{Z3\_500} = 33566.876\ \text{Amperes}$$

4-500kVA Transformers

$$Z4\_500 := \left(\frac{1}{4}\right)\cdot Z500 = 2.688\ \text{pu} \qquad I4\_500 := \frac{Ibase}{Z4\_500} = 44755.835\ \text{Amperes}$$

Original File by: Dan Mungovan, National Grid
Last Updated: January 19, 2012

750kVA Transformers

$$Z750 := Zt5 \cdot \left(\frac{Sbase}{0.75 \cdot 10^6} \right) = 7.167 \ \text{pu}$$

1-750kVA Transformer

$$Z1\_750 := \left(\frac{1}{1} \right) \cdot Z750 = 7.167 \ \text{pu} \qquad I1\_750 := \frac{Ibase}{Z1\_750} = 16783.438 \ \text{Amperes}$$

2-750kVA Transformers

$$Z2\_750 := \left(\frac{1}{2} \right) \cdot Z750 = 3.583 \ \text{pu} \qquad I2\_750 := \frac{Ibase}{Z2\_750} = 33566.876 \ \text{Amperes}$$

3-750kVA Transformers

$$Z3\_750 := \left(\frac{1}{3} \right) \cdot Z750 = 2.389 \ \text{pu} \qquad I3\_750 := \frac{Ibase}{Z3\_750} = 50350.314 \ \text{Amperes}$$

4-750kVA Transformers

$$Z4\_750 := \left(\frac{1}{4} \right) \cdot Z750 = 1.792 \ \text{pu} \qquad I4\_750 := \frac{Ibase}{Z4\_750} = 67133.752 \ \text{Amperes}$$

1000kVA Transformers

$$Z1000 := Zt5 \cdot \left(\frac{Sbase}{1 \cdot 10^6} \right) = 5.375 \ \text{pu}$$

1-1000kVA Transformers

$$Z1\_1000 := \left(\frac{1}{1} \right) \cdot Z1000 = 5.375 \ \text{pu} \qquad I1\_1000 := \frac{Ibase}{Z1\_1000} = 22377.917 \ \text{Amperes}$$

2-1000kVA Transformers

$$Z2\_1000 := \left(\frac{1}{2} \right) \cdot Z1000 = 2.688 \ \text{pu} \qquad I2\_1000 := \frac{Ibase}{Z2\_1000} = 44755.835 \ \text{Amperes}$$

3-1000kVA Transformers

$$Z3\_1000 := \left(\frac{1}{3} \right) \cdot Z1000 = 1.792 \ \text{pu} \qquad I3\_1000 := \frac{Ibase}{Z3\_1000} = 67133.752 \ \text{Amperes}$$

4-1000kVA Transformers

$$Z4\_1000 := \left(\frac{1}{4} \right) \cdot Z1000 = 1.344 \ \text{pu} \qquad I4\_1000 := \frac{Ibase}{Z4\_1000} = 89511.670 \ \text{Amperes}$$

1500kVA Transformers

$$Z1500 := Zt7 \cdot \left(\frac{Sbase}{1.5 \cdot 10^{6}}\right) = 5.017 \ \text{pu}$$

1-1500kVA Transformer

$$Z1\_1500 := \left(\frac{1}{1}\right) \cdot Z1500 = 5.017 \ \text{pu} \qquad I1\_1500 := \frac{Ibase}{Z1\_1500} = 23976.340 \ \text{Amperes}$$

2-1500kVA Transformers

$$Z2\_1500 := \left(\frac{1}{2}\right) \cdot Z1500 = 2.508 \ \text{pu} \qquad I2\_1500 := \frac{Ibase}{Z2\_1500} = 47952.680 \ \text{Amperes}$$

3-1500kVA Transformers

$$Z3\_1500 := \left(\frac{1}{3}\right) \cdot Z1500 = 1.672 \ \text{pu} \qquad I3\_1500 := \frac{Ibase}{Z3\_1500} = 71929.020 \ \text{Amperes}$$

4-1500kVA Transformers

$$Z4\_1500 := \left(\frac{1}{4}\right) \cdot Z1500 = 1.254 \ \text{pu} \qquad I4\_1500 := \frac{Ibase}{Z4\_1500} = 95905.360 \ \text{Amperes}$$

5-1500kVA Transformers

$$Z5\_1500 := \left(\frac{1}{5}\right) \cdot Z1500 = 1.003 \ \text{pu} \qquad I5\_1500 := \frac{Ibase}{Z5\_1500} = 119881.70(\ \text{Amperes}$$

2000kVA Transformers

$$Z2000 := Zt7 \cdot \left(\frac{Sbase}{2 \cdot 10^6}\right) = 3.763 \quad pu$$

1-2000kVA Transformer

$$Z1\_2000 := \left(\frac{1}{1}\right) \cdot Z2000 = 3.763 \quad pu \qquad I1\_2000 := \frac{Ibase}{Z1\_2000} = 31968.453 \quad Amperes$$

2-2000kVA Transformers

$$Z2\_2000 := \left(\frac{1}{2}\right) \cdot Z2000 = 1.881 \quad pu \qquad I2\_2000 := \frac{Ibase}{Z2\_2000} = 63936.907 \quad Amperes$$

3-2000kVA Transformers

$$Z3\_2000 := \left(\frac{1}{3}\right) \cdot Z2000 = 1.254 \quad pu \qquad I3\_2000 := \frac{Ibase}{Z3\_2000} = 95905.360 \quad Amperes$$

4-2000kVA Transformers

$$Z4\_2000 := \left(\frac{1}{4}\right) \cdot Z2000 = 0.941 \quad pu \qquad I4\_2000 := \frac{Ibase}{Z4\_2000} = 127873.81 \quad Amperes$$

2500kVA Transformers

$$Z2500 := Zt7 \cdot \left(\frac{Sbase}{2.5 \cdot 10^6}\right) = 3.010 \quad pu$$

1-2500kVA Transformer

$$Z1\_2500 := \left(\frac{1}{1}\right) \cdot Z2500 = 3.010 \quad pu \qquad I1\_2500 := \frac{Ibase}{Z1\_2500} = 39960.567 \quad Amperes$$

2-2500kVA Transformers

$$Z2\_2500 := \left(\frac{1}{2}\right) \cdot Z2500 = 1.505 \quad pu \qquad I2\_2500 := \frac{Ibase}{Z2\_2500} = 79921.134 \quad Amperes$$

3-2500kVA Transformers

$$Z3\_2500 := \left(\frac{1}{3}\right) \cdot Z2500 = 1.003 \quad pu \qquad I3\_2500 := \frac{Ibase}{Z3\_2500} = 119881.70 \quad Amperes$$

4-2500kVA Transformers

$$Z4\_2500 := \left(\frac{1}{4}\right) \cdot Z2500 = 0.753 \quad pu \qquad I4\_2500 := \frac{Ibase}{Z4\_2500} = 159842.26 \quad Amperes$$

APPENDIX B

Mathcad[TM] Arcing Fault and Incident Energy Calculation Worksheet

"SpotNWIncidentEnergy.xmcd"

MathCad File: SpotNWIncidentEnergy.xmcd

This file calculates the arcing current and resultant incident energy levels in a 480 volt spot network system using the IEEE 1584-2002 equations.

Assumptions:

- Work within a network protector will result in the greatest Incident Energy
- Network Protectors are "box configurations"
- Bolted fault currents are as calculated in SpotNetworkFault.xmcd

Input variables for calculating the **arcing current** (IEEE 1584-2002 Eq. 1 & 3) are defined below:

lg	is the log base 10
Ia	is the arcing current (kA)
K	is the arcing current box configuration constant
Ibf	is bolted fault current for three phase faults (symmetrical RMS) (kA)
V	is system voltage (kV)
G	is the gap between conductors, (mm) (see Table 4 IEEE 1584-2002)

$K := -0.097$ $V := 0.480\ \text{kV}$ $G := 32\ \text{mm}$

Input variables for calculating the **normalized incident energy** (IEEE 1584-2002 Eq. 4 & 5) are defined below:

lg	is the log base 10
Ia	is the arcing current (kA)
En	is incident energy (J/cm^2) normalized for time and distance
K1	is the incident energy box configuration constant
K2	is the grounded configuration constant
G	is the gap between conductors, (mm) (see Table 4 IEEE 1584-2002)

$K1 := -0.555$ $K2 := -0.113$

Input variables for calculating the **incident energy** (IEEE 1584-2002 Eq. E.1) are defined below:

E	is incident energy (cal/cm^2)
Cf	is calculation factor for voltages at or below 1kV
En	is incident energy (J/cm^2) normalized for time and distance
t	is arcing time (seconds)
D	is distance from possible arc point to the person (mm)
x	is the distance exponent (see Table 4 IEEE 1584-2002)

$Cf := 1.5$ $D := 610\ \text{mm}$ $x := 1.473$ $t := 0.64$ seconds

Original File by: Dan Mungovan, National Grid
Last Updated: January 19, 2012

750kVA Transformers (1, 2, 3, and 4 units)

Arcing Current Calculation

Ibf :=

	0
0	16.783
1	33.567
2	50.35
3	67.134

kA

$$Ibf = \begin{pmatrix} 16.783 \\ 33.567 \\ 50.35 \\ 67.134 \end{pmatrix} \text{ kA}$$

$$Ia(Ibf) := (K) + (0.662 \cdot \log(Ibf)) + (0.0966 \cdot V) + (0.000526 \cdot G) + (0.5588 \cdot V \cdot \log(Ibf)) - (0.00304 \cdot G \cdot \log(Ibf))$$

$$Ia(Ibf) := 10^{Ia(Ibf)}$$

$$Ia(Ibf) = \begin{pmatrix} 9.693 \\ 17.266 \\ 24.203 \\ 30.757 \end{pmatrix} \text{ kA} \qquad Ia85 := 0.85 \cdot Ia(Ibf) = \begin{pmatrix} 8.239 \\ 14.676 \\ 20.573 \\ 26.143 \end{pmatrix} \text{ kA}$$

Normalized Incident Energy Calculation for 100% Arcing Current

$$En := K1 + K2 + (1.081 \cdot \log(Ia(Ibf))) + (0.0011 \cdot G)$$

$$En := 10^{En}$$

$$En = \begin{pmatrix} 2.714 \\ 5.065 \\ 7.297 \\ 9.455 \end{pmatrix} \text{ J/cm}^2$$

Incident Energy Calculation for 100% Arcing Current

$$t = 0.64 \qquad E := Cf \cdot En \cdot \left(\frac{t}{0.2}\right) \cdot \left(\frac{610^x}{D^x}\right) \qquad E = \begin{pmatrix} 13.025 \\ 24.314 \\ 35.027 \\ 45.384 \end{pmatrix} \text{ cal/cm}^2$$

Normalized Incident Energy Calculation for 85% Arcing Current

$$En := K1 + K2 + (1.081 \cdot \log(Ia85)) + (0.0011 \cdot G)$$

$$En := 10^{En}$$

$$En = \begin{pmatrix} 2.276 \\ 4.249 \\ 6.122 \\ 7.932 \end{pmatrix} \text{ J/cm}^2$$

Incident Energy Calculation for 85% Arcing Current

$$t = 0.64 \qquad E := Cf \cdot En \cdot \left(\frac{t}{0.2}\right) \cdot \left(\frac{610^x}{D^x}\right) \qquad E = \begin{pmatrix} 10.927 \\ 20.397 \\ 29.384 \\ 38.072 \end{pmatrix} \text{ cal/cm}^2$$

1000kVA Transformers (1, 2, 3, and 4 units)

Arcing Current Calculation

Ibf :=

	0
0	22.378
1	44.756
2	67.134
3	89.512

kA

$$Ibf = \begin{pmatrix} 22.378 \\ 44.756 \\ 67.134 \\ 89.512 \end{pmatrix} \text{ kA}$$

$$Ia(Ibf) := (K) + (0.662 \cdot \log(Ibf)) + (0.0966 \cdot V) + (0.000526 \cdot G) + (0.5588 \cdot V \cdot \log(Ibf)) - (0.00304 \cdot G \cdot \log(Ibf))$$

$$Ia(Ibf) := 10^{Ia(Ibf)}$$

$$Ia(Ibf) = \begin{pmatrix} 12.318 \\ 21.942 \\ 30.757 \\ 39.085 \end{pmatrix} \text{ kA} \qquad Ia85 := 0.85 \cdot Ia(Ibf) = \begin{pmatrix} 10.47 \\ 18.65 \\ 26.143 \\ 33.222 \end{pmatrix} \text{ kA}$$

Normalized Incident Energy Calculation for 100% Arcing Current

$$En := K1 + K2 + (1.081 \cdot \log(Ia(Ibf))) + (0.0011 \cdot G)$$

$$En := 10^{En}$$

$$En = \begin{pmatrix} 3.516 \\ 6.563 \\ 9.455 \\ 12.251 \end{pmatrix} \text{ J/cm}^2$$

Incident Energy Calculation for 100% Arcing Current

$$t = 0.64 \qquad E := Cf \cdot En \cdot \left(\frac{t}{0.2}\right) \cdot \left(\frac{610^x}{D^x}\right) \qquad E = \begin{pmatrix} 16.877 \\ 31.503 \\ 45.384 \\ 58.803 \end{pmatrix} \text{ cal/cm}^2$$

Normalized Incident Energy Calculation for 85% Arcing Current

$$En := K1 + K2 + (1.081 \cdot \log(Ia85)) + (0.0011 \cdot G)$$

$$En := 10^{En}$$

$$En = \begin{pmatrix} 2.95 \\ 5.506 \\ 7.932 \\ 10.277 \end{pmatrix} \text{ J/cm}^2$$

Incident Energy Calculation for 85% Arcing Current

$$t = 0.64 \qquad E := Cf \cdot En \cdot \left(\frac{t}{0.2}\right) \cdot \left(\frac{610^x}{D^x}\right) \qquad E = \begin{pmatrix} 14.158 \\ 26.427 \\ 38.072 \\ 49.329 \end{pmatrix} \text{ cal/cm}^2$$

1500kVA Transformers (1, 2, 3, 4, and 5 units)

Arcing Current Calculation

Ibf :=

	0
0	23.976
1	47.953
2	71.929
3	95.905
4	119.882

kA

$$Ibf = \begin{pmatrix} 23.976 \\ 47.953 \\ 71.929 \\ 95.905 \\ 119.882 \end{pmatrix} \text{ kA}$$

$$Ia(Ibf) := (K) + (0.662\cdot\log(Ibf)) + (0.0966\cdot V) + (0.000526\cdot G) + (0.5588\cdot V\cdot\log(Ibf)) - (0.00304\cdot G\cdot\log(Ibf))$$

$$Ia(Ibf) := 10^{Ia(Ibf)}$$

$$Ia(Ibf) = \begin{pmatrix} 13.046 \\ 23.239 \\ 32.576 \\ 41.396 \\ 49.852 \end{pmatrix} \text{ kA} \qquad Ia85 := 0.85\cdot Ia(Ibf) = \begin{pmatrix} 11.089 \\ 19.754 \\ 27.69 \\ 35.187 \\ 42.374 \end{pmatrix} \text{ kA}$$

Normalized Incident Energy Calculation for 100% Arcing Current

$$En := K1 + K2 + (1.081\cdot\log(Ia(Ibf))) + (0.0011\cdot G)$$

$$En := 10^{En}$$

$$En = \begin{pmatrix} 3.741 \\ 6.984 \\ 10.061 \\ 13.036 \\ 15.937 \end{pmatrix} \text{ J/cm}^2$$

1500kVA Transformers
Continued

Incident Energy Calculation for 100% Arcing Current

$t = 0.64$

$$E := Cf \cdot En \cdot \left(\frac{t}{0.2}\right) \cdot \left(\frac{610^x}{D^x}\right)$$

$$E = \begin{pmatrix} 17.959 \\ 33.522 \\ 48.293 \\ 62.572 \\ 76.496 \end{pmatrix}$$ cal/cm²

Normalized Incident Energy Calculation for 85% Arcing Current

$$En := K1 + K2 + (1.081 \cdot \log(Ia85)) + (0.0011 \cdot G)$$

$$En := 10^{En}$$

$$En = \begin{pmatrix} 3.139 \\ 5.859 \\ 8.44 \\ 10.935 \\ 13.369 \end{pmatrix}$$ J/cm²

Incident Energy Calculation for 85% Arcing Current

$t = 0.64$

$$E := Cf \cdot En \cdot \left(\frac{t}{0.2}\right) \cdot \left(\frac{610^x}{D^x}\right)$$

$$E = \begin{pmatrix} 15.065 \\ 28.121 \\ 40.512 \\ 52.49 \\ 64.171 \end{pmatrix}$$ cal/cm²

2000kVA Transformers (1, 2, 3, and 4 units)

Arcing Current Calculation

Ibf :=

	0
0	31.968
1	63.937
2	95.905
3	127.874

kA

$$Ibf = \begin{pmatrix} 31.968 \\ 63.937 \\ 95.905 \\ 127.874 \end{pmatrix} \text{ kA}$$

$$Ia(Ibf) := (K) + (0.662 \cdot \log(Ibf)) + (0.0966 \cdot V) + (0.000526 \cdot G) + (0.5588 \cdot V \cdot \log(Ibf)) - (0.00304 \cdot G \cdot \log(Ibf))$$

$$Ia(Ibf) := 10^{Ia(Ibf)}$$

$$Ia(Ibf) = \begin{pmatrix} 16.578 \\ 29.532 \\ 41.396 \\ 52.606 \end{pmatrix} \text{ kA} \qquad Ia85 := 0.85 \cdot Ia(Ibf) = \begin{pmatrix} 14.092 \\ 25.102 \\ 35.187 \\ 44.715 \end{pmatrix} \text{ kA}$$

Normalized Incident Energy Calculation for 100% Arcing Current

$$En := K1 + K2 + (1.081 \cdot \log(Ia(Ibf))) + (0.0011 \cdot G)$$

$$En := 10^{En}$$

$$En = \begin{pmatrix} 4.848 \\ 9.049 \\ 13.036 \\ 16.89 \end{pmatrix} \text{ J/cm}^2$$

Incident Energy Calculation for 100% Arcing Current

$$t = 0.64 \qquad E := Cf \cdot En \cdot \left(\frac{t}{0.2}\right) \cdot \left(\frac{610^x}{D^x}\right) \qquad E = \begin{pmatrix} 23.268 \\ 43.434 \\ 62.572 \\ 81.073 \end{pmatrix} \text{ cal/cm}^2$$

Normalized Incident Energy Calculation for 85% Arcing Current

$$En := K1 + K2 + (1.081 \cdot \log(Ia85)) + (0.0011 \cdot G)$$

$$En := 10^{En}$$

$$En = \begin{pmatrix} 0.609 \\ 0.88 \\ 1.039 \\ 1.151 \end{pmatrix} \text{ J/cm}^2$$

Incident Energy Calculation for 85% Arcing Current

$$t = 0.64 \qquad E := Cf \cdot En \cdot \left(\frac{t}{0.2}\right) \cdot \left(\frac{610^x}{D^x}\right) \qquad E = \begin{pmatrix} 19.52 \\ 36.436 \\ 52.49 \\ 68.011 \end{pmatrix} \text{ cal/cm}^2$$

2500kVA Transformers (1, 2, 3, and 4 units)

Arcing Current Calculation

Ibf :=

	0
0	39.96
1	79.921
2	119.882
3	159.842

kA

$$Ibf = \begin{pmatrix} 39.96 \\ 79.921 \\ 119.882 \\ 159.842 \end{pmatrix} \text{ kA}$$

$$Ia(Ibf) := (K) + (0.662 \cdot \log(Ibf)) + (0.0966 \cdot V) + (0.000526 \cdot G) + (0.5588 \cdot V \cdot \log(Ibf)) - (0.00304 \cdot G \cdot \log(Ibf))$$

$$Ia(Ibf) := 10^{Ia(Ibf)}$$

$$Ia(Ibf) = \begin{pmatrix} 19.965 \\ 35.564 \\ 49.852 \\ 63.351 \end{pmatrix} \text{ kA} \qquad Ia85 := 0.85 \cdot Ia(Ibf) = \begin{pmatrix} 16.97 \\ 30.229 \\ 42.374 \\ 53.848 \end{pmatrix} \text{ kA}$$

Normalized Incident Energy Calculation for 100% Arcing Current

$$En := K1 + K2 + (1.081 \cdot \log(Ia(Ibf))) + (0.0011 \cdot G)$$

$$En := 10^{En}$$

$$En = \begin{pmatrix} 5.926 \\ 11.062 \\ 15.937 \\ 20.649 \end{pmatrix} \text{ J/cm}^2$$

Incident Energy Calculation for 100% Arcing Current

$$t = 0.64 \qquad E := Cf \cdot En \cdot \left(\frac{t}{0.2}\right) \cdot \left(\frac{610^x}{D^x}\right) \qquad E = \begin{pmatrix} 28.446 \\ 53.099 \\ 76.496 \\ 99.114 \end{pmatrix} \text{ cal/cm}^2$$

Normalized Incident Energy Calculation for 85% Arcing Current

$$En := K1 + K2 + (1.081 \cdot \log(Ia85)) + (0.0011 \cdot G)$$

$$En := 10^{En}$$

$$En = \begin{pmatrix} 4.972 \\ 9.28 \\ 13.369 \\ 17.322 \end{pmatrix} \text{ J/cm}^2$$

Incident Energy Calculation for 85% Arcing Current

$$t = 0.64 \qquad E := Cf \cdot En \cdot \left(\frac{t}{0.2}\right) \cdot \left(\frac{610^x}{D^x}\right) \qquad E = \begin{pmatrix} 23.863 \\ 44.544 \\ 64.171 \\ 83.145 \end{pmatrix} \text{ cal/cm}^2$$

APPENDIX C

Network Transformer Energized

Incident Energy Values in cal/cm^2

Division	System	Spot Network	Vault Number	Cable Number	cal/cm2
NEN	Lynn	195 Market St.	45	1383	5389
NEN	Lynn	195 Market St.	45	1384	5389
NEN	Lynn	195 Market St.	45	1385	5389
NEN	Worcester	Verizon	2	5	5389
NEN	Worcester	Verizon	2	6	5389
NEN	Worcester	Verizon	2	8A	5389
NEN	Worcester	91 Franklin Sq. Worc. Library	56	6A	3741
NEN	Worcester	91 Franklin Sq. Worc. Library	56	7	3741
NEN	Worcester	Unum Provident	63	5	3981
NEN	Worcester	Unum Provident	63	8	3981
NEN	Worcester	Worcester Center	67	50	3741
NEN	Worcester	Worcester Center	67	51	3741
NEN	Worcester	Worcester Center	68	1	5389
NEN	Worcester	Worcester Center	68	50	5389
NEN	Worcester	Worcester Center	68	51	5389
NEN	Worcester	Worcester Center	69	50	3741
NEN	Worcester	Worcester Center	69	51	3741
NEN	Worcester	Worcester Center	70	50	2887
NEN	Worcester	Worcester Center	70	51	2887
NEN	Worcester	Worcester Center	73	1	5735
NEN	Worcester	Worcester Center	73	50	5735
NEN	Worcester	Worcester Center	73	51	5735
NEN	Worcester	Guaranty Bank & Trust	74	50	3981
NEN	Worcester	Guaranty Bank & Trust	74	51	3981
NEN	Worcester	446 Main St. Shawmut Tower	76	1	4159
NEN	Worcester	446 Main St. Shawmut Tower	76	50	4159
NEN	Worcester	446 Main St. Shawmut Tower	76	51	4159
NEN	Worcester	44 Front St.	81	7A	2887
NEN	Worcester	44 Front St.	81	8	2887
NEN	Worcester	474 Main St. Neescom/Lightower	82	50	3981
NEN	Worcester	474 Main St. Neescom/Lightower	82	51	3981
NEN	Worcester	One Chestnut Place	84	50	3741
NEN	Worcester	One Chestnut Place	84	51	3741
NEN	Worcester	600 Main St. Franklin Sq. Tower	85	6A	3741
NEN	Worcester	600 Main St. Franklin Sq. Tower	85	7A	3741
NEN	Worcester	Convention Center	86	50	3981
NEN	Worcester	Convention Center	86	51	3981
NEN	Worcester	50 Foster St. - DCU Center	90	6	2763
NEN	Worcester	50 Foster St. - DCU Center	90	7A	2763
NEN	Worcester	50 Foster St. - DCU Center	90	8	2763

Table 1: Incident Energy Values, Transformer Energized – New England North

Division	System	Spot Network	Vault Number	Cable Number	cal/cm2
NES	Brockton	65 Crescent TelCo	68	20W6	3741
NES	Brockton	65 Crescent TelCo	96	20W9	3741
NES	Providence	Industrial Trust	2	1105	5389
NES	Providence	Industrial Trust	2	1109	5389
NES	Providence	Industrial Trust	2	1113	5389
NES	Providence	Telephone Co. (CustOwn)	16	1107	7430
NES	Providence	Telephone Co. (CustOwn)	16	1111	7430
NES	Providence	Telephone Co. (CustOwn)	16	1127	7430
NES	Providence	Telephone Co. (CustOwn)	16	1139	7430
NES	Providence	40 Westminster	79	1109	5389
NES	Providence	40 Westminster	79	1111	5389
NES	Providence	40 Westminster	79	1113	5389
NES	Providence	Hospital Trust Tower	83	1105	5389
NES	Providence	Hospital Trust Tower	83	1109	5389
NES	Providence	Hospital Trust Tower	83	1139	5389
NES	Providence	Civic Center	85	1109	5735
NES	Providence	Civic Center	85	1113	5735
NES	Providence	Civic Center	85	1139	5735
NES	Providence	Biltmore	87	1135	3981
NES	Providence	Biltmore	87	1139	3981
NES	Providence	Blue Cross	91	1107	3981
NES	Providence	Blue Cross	91	1111	3981
NES	Providence	Gilbane	92	1135	2887
NES	Providence	Gilbane	92	1139	2887
NES	Providence	Judicial Complex	93	1105	3741
NES	Providence	Judicial Complex	93	1113	3741
NES	Providence	Amica	97	1105	3981
NES	Providence	Amica	97	1139	3981
NES	Providence	Fleet Tower	102	1107	6983
NES	Providence	Fleet Tower	102	1109	6983
NES	Providence	Fleet Tower	102	1113	6983
NES	Providence	Fleet Tower	102	1135	6983
NES	Providence	Shepard Bldg	116	1111	5158
NES	Providence	Shepard Bldg	116	1135	5158

Table 2: Incident Energy Values, Transformer Energized – New England South

Division	System	Spot Network	Vault Number	Cable Number	cal/cm2
NYE	Albany	41 State St.	3321	T8	5389
NYE	Albany	41 State St.	3321	T6	5389
NYE	Albany	41 State St.	3321	T10	5389
NYE	Albany	80 State St.	7010	T6	3981
NYE	Albany	80 State St.	7011	T8	3981
NYE	Albany	AE Smith	2261	R7	2133
NYE	Albany	AE Smith	2262	R5	2133
NYE	Albany	AE Smith	2263	R2	2133
NYE	Albany	AE Smith	2265	R12	2133
NYE	Albany	State Education Bldg	82	R2	2133
NYE	Albany	State Education Bldg	82	R5	2133
NYE	Albany	State Education Bldg	5960	R7	2133
NYE	Albany	Albany Justice Bldg	9713	T10	2133
NYE	Albany	Albany Justice Bldg	9714	T6	2133
NYE	Albany	Kenmore Hotel	7284	R5	3741
NYE	Albany	Kenmore Hotel	7285	R15	3741
NYE	Albany	Verizon Building State St	2767	T10	5389
NYE	Albany	Verizon Building State St	2765	T8	5389
NYE	Albany	Verizon Building State St	2766	T6	5389
NYE	Albany	Twin Towers	4059	R2	11770
NYE	Albany	Twin Towers	4059	R1	11770
NYE	Albany	Twin Towers	4059	R11	11770
NYE	Albany	Twin Towers	4059	R15	11770

Table 3: Incident Energy Values, Transformer Energized – New York East, Albany

Division	System	Spot Network	Vault Number	Cable Number	cal/cm2
NYE	Schenectady	Bowtie Theater	10058	3	1547
NYE	Schenectady	Bowtie Theater	10057	6	1547
NYE	Schenectady	NYS DOT	9570	3	2133
NYE	Schenectady	NYS DOT	9572	6	2133
NYE	Schenectady	Proctors Theater	9890	8	2133
NYE	Schenectady	Proctors Theater	9891	7	2133
NYE	Schenectady	Proctors Theater	9892	6	2133
NYE	Schenectady	Wallace Bldg	1830	7	3981
NYE	Schenectady	Wallace Bldg	1831	3	3981
NYE	Troy	Grim Mall	1246	11	5158
NYE	Troy	Grim Mall	1247	7	5158

Table 4: Incident Energy Values, Transformer Energized – New York East, Schenectady & Troy

Division	System	Spot Network	Vault Number	Cable Number	cal/cm2
NYE	Albany 34.5	Albany Pearl St Associates	9412	R8	3378
NYE	Albany 34.5	Albany Pearl St Associates	9413	R10	3378
NYE	Albany 34.5	Albany Pearl St Associates	9414	R14	3378
NYE	Albany 34.5	SUNY Plaza	6227	R8	7430
NYE	Albany 34.5	SUNY Plaza	6228	R10	7430
NYE	Albany 34.5	SUNY Plaza	6229	R9	7430
NYE	Albany 34.5	NYS Comptroller Building	9406	R8	2763
NYE	Albany 34.5	NYS Comptroller Building	9407	R9	2763
NYE	Albany 34.5	NYS Comptroller Building	9408	R10	2763
NYE	Albany 34.5	Columbia	9724	R35	2763
NYE	Albany 34.5	Columbia	9723	R8	2763
NYE	Albany 34.5	Charter One Bank	6121	R10	3741
NYE	Albany 34.5	Charter One Bank	6122	R8	3741
NYE	Albany 34.5	Crowne Plaza	6767	R9	5158
NYE	Albany 34.5	Crowne Plaza	6768	R14	5158
NYE	Albany 34.5	NYS Dorm Authority	9022	R10	2763
NYE	Albany 34.5	NYS Dorm Authority	9023	R8	2763
NYE	Albany 34.5	Dewitt Clinton	6219	R8	3741
NYE	Albany 34.5	Dewitt Clinton	6220	R10	3741
NYE	Albany 34.5	Federal Bldg	6054	R14	5158
NYE	Albany 34.5	Federal Bldg	6055	R9	5158
NYE	Albany 34.5	NBT Bank	5479	R14	5158
NYE	Albany 34.5	NBT Bank	5480	R9	5158
NYE	Albany 34.5	Kiernan Plaza	7274	R14	3378
NYE	Albany 34.5	Kiernan Plaza	7273	R9	3378
NYE	Albany 34.5	Omni Bldg	8013	R9	2133
NYE	Albany 34.5	Omni Bldg	8014	R14	2133
NYE	Albany 34.5	Omni Plaza	7436	R10	2133
NYE	Albany 34.5	Omni Plaza	7437	R8	2133
NYE	Albany 34.5	Ten Eyck Bldg	6147	R8	7430
NYE	Albany 34.5	Ten Eyck Bldg	6148	R10	7430
NYE	Albany 34.5	Ten Eyck Bldg	6149	R9	7430

Table 5: Incident Energy Values, Transformer Energized – New York East, Albany 34.5kV

Division	System	Spot Network	Vault Number	Cable Number	cal/cm2
NYC	Utica	M&T Bank	N-28-2	65144	2004
NYC	Utica	M&T Bank	N-28-3	65145	2004
NYC	Utica	NYS Office Bldg	N-3057	65147	2133
NYC	Utica	NYS Office Bldg	N-3058	65145	2133
NYC	Utica	NYS Office Bldg	N-3059	65144	2133
NYC	Utica	Oneida Office Bldg	N-3060	65144	2004
NYC	Utica	Oneida Office Bldg	N-3061	65146	2004
NYC	Utica	Oneida Office Bldg	N-3062	65147	2004
NYC	Watertown	Dulles State Ofc Bldg	N-6003	74860	2133
NYC	Watertown	Dulles State Ofc Bldg	N-7403	74874	2133

Table 6: Incident Energy Values, Transformer Energized – New York Central, Utica & Watertown

Division	System	Spot Network	Vault Number	Cable Number	cal/cm2
NYC	Syracuse (Ash)	Bryant & Stratton	N-44109	22344	1547
NYC	Syracuse (Ash)	Bryant & Stratton	N-47108	22347	1547
NYC	Syracuse (Ash)	Financial One	N-42181	22342	2004
NYC	Syracuse (Ash)	Financial One	N-45180	22345	2004
NYC	Syracuse (Ash)	Galleries	N-40198	22340	2133
NYC	Syracuse (Ash)	Galleries	N-42199	22342	2133
NYC	Syracuse (Ash)	Galleries	N-45200	22345	2133
NYC	Syracuse (Ash)	Herald Journal	N-40220	22340	2133
NYC	Syracuse (Ash)	Herald Journal	N-43219	22343	2133
NYC	Syracuse (Ash)	Herald Journal	N-48218	22348	2133
NYC	Syracuse (Ash)	Herald Journal (100)	N-40124	22340	2133
NYC	Syracuse (Ash)	Herald Journal (100)	N-43125	22343	2133
NYC	Syracuse (Ash)	Herald Journal (100)	N-48126	22348	2133
NYC	Syracuse (Ash)	HSBC	N-41152	22341	2004
NYC	Syracuse (Ash)	HSBC	N-42151	22342	2004
NYC	Syracuse (Ash)	HSBC	N-45150	22345	2004
NYC	Syracuse (Ash)	James Square	N-44186	22344	2133
NYC	Syracuse (Ash)	James Square	N-49187	22349	2133
NYC	Syracuse (Ash)	NMPC	N-42194	22342	2004
NYC	Syracuse (Ash)	NMPC	N-43195	22343	2004
NYC	Syracuse (Ash)	NMPC Parking Lot	N-41153	22341	2133
NYC	Syracuse (Ash)	NMPC Parking Lot	N-43154	22343	2133
NYC	Syracuse (Ash)	NMPC Parking Lot	N-48155	22348	2133
NYC	Syracuse (Ash)	Onondaga County Jail	N-45213	22345	2133
NYC	Syracuse (Ash)	Onondaga County Jail	N-49212	22349	2133
NYC	Syracuse (Ash)	Sibley's Garage	N-40128	22340	2004
NYC	Syracuse (Ash)	Sibley's Garage	N-43129	22343	2004
NYC	Syracuse (Ash)	Sibley's Garage	N-49130	22349	2004
NYC	Syracuse (Ash)	Washington Station	N-40223	22340	2004
NYC	Syracuse (Ash)	Washington Station	N-46224	22346	2004

Table 7: Incident Energy Values, Transformer Energized – New York Central, Syracuse (Ash St.)

Division	System	Spot Network	Vault Number	Cable Number	cal/cm2
NYC	Syracuse (Temple)	Atrium	N-49147	24349	2004
NYC	Syracuse (Temple)	Atrium	N-56146	24356	2004
NYC	Syracuse (Temple)	Atrium	N-58145	24358	2004
NYC	Syracuse (Temple)	AXA (Mony Plaza)	N-53097	24353	2133
NYC	Syracuse (Temple)	AXA (Mony Plaza)	N-49100	24349	2133
NYC	Syracuse (Temple)	AXA (Mony Plaza)	N-54099	24354	2133
NYC	Syracuse (Temple)	AXA (Mony Plaza)	N-57096	24357	2133
NYC	Syracuse (Temple)	AXA (Mony Plaza)	N-58101	24358	2133
NYC	Syracuse (Temple)	Onon. Co. Steam Plant	N-53177	24353	2133
NYC	Syracuse (Temple)	Onon. Co. Steam Plant	N-54176	24354	2133
NYC	Syracuse (Temple)	Onon. Co. Steam Plant	N-58178	24358	2133
NYC	Syracuse (Temple)	Chimes Bldg	N-50134	24350	2133
NYC	Syracuse (Temple)	Chimes Bldg	N-53060	24353	2133
NYC	Syracuse (Temple)	Civic Center	N-50161	24350	2133
NYC	Syracuse (Temple)	Civic Center	N-53162	24353	2133
NYC	Syracuse (Temple)	Civic Center	N-54163	24354	2133
NYC	Syracuse (Temple)	Clinton Properties	N-49168	24349	2004
NYC	Syracuse (Temple)	Clinton Properties	N-56167	24356	2004
NYC	Syracuse (Temple)	Clinton Properties	N-58169	24358	2004
NYC	Syracuse (Temple)	Convention Center	N-50211	24350	2133
NYC	Syracuse (Temple)	Convention Center	N-54209	24354	2133
NYC	Syracuse (Temple)	Convention Center	N-58210	24358	2133
NYC	Syracuse (Temple)	Salvation Army	N-53118	24353	2133
NYC	Syracuse (Temple)	Salvation Army	N-57119	24357	2133
NYC	Syracuse (Temple)	Federal Bldg	N-49166	24349	2133
NYC	Syracuse (Temple)	Federal Bldg	N-56164	24356	2133
NYC	Syracuse (Temple)	Federal Bldg	N-58165	24358	2133
NYC	Syracuse (Temple)	Greystone Sq	N-49202	24349	2004
NYC	Syracuse (Temple)	Greystone Sq	N-57201	24357	2004
NYC	Syracuse (Temple)	Crowne Plaza	N-54114	24354	2133
NYC	Syracuse (Temple)	Crowne Plaza	N-57115	24357	2133
NYC	Syracuse (Temple)	Lincoln Bank	N-49140	24349	2133
NYC	Syracuse (Temple)	Lincoln Bank	N-56142	24356	2133
NYC	Syracuse (Temple)	Lincoln Bank	N-58141	24358	2133
NYC	Syracuse (Temple)	Madison Manor	N-54174	24354	2004
NYC	Syracuse (Temple)	Madison Manor	N-57175	24357	2004
NYC	Syracuse (Temple)	One Park Place	N-54190	24354	2133
NYC	Syracuse (Temple)	One Park Place	N-58191	24358	2133
NYC	Syracuse (Temple)	University Health Care	N-54159	24354	2004
NYC	Syracuse (Temple)	University Health Care	N-57158	24357	2004
NYC	Syracuse (Temple)	Syrtel	N-50135	24350	2133
NYC	Syracuse (Temple)	Syrtel	N-53137	24353	2133
NYC	Syracuse (Temple)	Syrtel	N-58170	24358	2133
NYC	Syracuse (Temple)	W. Washington (AT&T)	N-49203	24349	2004
NYC	Syracuse (Temple)	W. Washington (AT&T)	N-56205	24356	2004

Table 8: Incident Energy Values, Transformer Energized – New York Central, Syracuse (Temple St.)

Division	System	Spot Network	Vault Number	Cable Number	cal/cm2
NYW	Buffalo (Elm)	Buffalo Library	103	16E	5389
NYW	Buffalo (Elm)	Buffalo Library	103	2E	5389
NYW	Buffalo (Elm)	Buffalo Library	103	35E	5389
NYW	Buffalo (Elm)	Erie County Court	115	35E	5389
NYW	Buffalo (Elm)	Erie County Court	115	3E	5389
NYW	Buffalo (Elm)	Erie County Court	115	5E	5389
NYW	Buffalo (Elm)	Merchants Mutual	116	10E	3741
NYW	Buffalo (Elm)	Merchants Mutual	116	8E	3741
NYW	Buffalo (Elm)	M&T Bank	119	1E	5389
NYW	Buffalo (Elm)	M&T Bank	119	23E	5389
NYW	Buffalo (Elm)	M&T Bank	119	2E	5389
NYW	Buffalo (Elm)	120MainPlace	120	23E	3741
NYW	Buffalo (Elm)	120MainPlace	120	3E	3741
NYW	Buffalo (Elm)	Avant Building	121	6E	5735
NYW	Buffalo (Elm)	Avant Building	121	17E	5735
NYW	Buffalo (Elm)	Avant Building	121	8E	5735
NYW	Buffalo (Elm)	122Main Place	122	6E	3741
NYW	Buffalo (Elm)	122Main Place	122	8E	3741
NYW	Buffalo (Elm)	123Main Place	123	3E	5389
NYW	Buffalo (Elm)	123Main Place	123	1E	5389
NYW	Buffalo (Elm)	123Main Place	123	23E	5389
NYW	Buffalo (Elm)	124Main Place	124	10E	7430
NYW	Buffalo (Elm)	124Main Place	124	1E	7430
NYW	Buffalo (Elm)	124Main Place	124	3E	7430
NYW	Buffalo (Elm)	124Main Place	124	8E	7430
NYW	Buffalo (Elm)	Rath Bldg	126	6E	7430
NYW	Buffalo (Elm)	Rath Bldg	126	10E	7430
NYW	Buffalo (Elm)	Rath Bldg	126	3E	7430
NYW	Buffalo (Elm)	Rath Bldg	126	8E	7430
NYW	Buffalo (Elm)	City Hall	128	17E	4159
NYW	Buffalo (Elm)	City Hall	128	35E	4159
NYW	Buffalo (Elm)	City Hall	128	5E	4159
NYW	Buffalo (Elm)	HSBC Basement	131	10E	3378
NYW	Buffalo (Elm)	HSBC Basement	131	23E	3378
NYW	Buffalo (Elm)	HSBC Basement	131	2E	3378
NYW	Buffalo (Elm)	HSBC Basement	131	3E	3378
NYW	Buffalo (Elm)	HSBC Penthouse	132	10E	2133
NYW	Buffalo (Elm)	HSBC Penthouse	132	23E	2133
NYW	Buffalo (Elm)	HSBC Penthouse	132	3E	2133

Table 9 – Part 1: Incident Energy Values, Transformer Energized – New York West, Buffalo (Elm)

Division	System	Spot Network	Vault Number	Cable Number	cal/cm2
NYW	Buffalo (Elm)	Convention Center	134	18E	2133
NYW	Buffalo (Elm)	Convention Center	134	35E	2133
NYW	Buffalo (Elm)	Buffalo City Court	135	35E	5389
NYW	Buffalo (Elm)	Buffalo City Court	135	5E	5389
NYW	Buffalo (Elm)	Buffalo City Court	135	7E	5389
NYW	Buffalo (Elm)	BAC	139	5E	3741
NYW	Buffalo (Elm)	BAC	139	9E	3741
NYW	Buffalo (Elm)	NFTA	140	1E	2133
NYW	Buffalo (Elm)	NFTA	140	2E	2133
NYW	Buffalo (Elm)	Adams Mark	141	35E	3378
NYW	Buffalo (Elm)	Adams Mark	141	7E	3378
NYW	Buffalo (Elm)	ECC	142	1E	2133
NYW	Buffalo (Elm)	ECC	142	2E	2133
NYW	Buffalo (Elm)	Gold Dome	143	4E	3378
NYW	Buffalo (Elm)	Gold Dome	143	5E	3378
NYW	Buffalo (Elm)	Bank of America	144	1E	2133
NYW	Buffalo (Elm)	Bank of America	144	2E	2133
NYW	Buffalo (Elm)	Prudential	148	8E	2004
NYW	Buffalo (Elm)	Prudential	148	9E	2004
NYW	Buffalo (Elm)	Hyatt Regency	149	4E	2133
NYW	Buffalo (Elm)	Hyatt Regency	149	6E	2133
NYW	Buffalo (Elm)	EC Holding Center	150	35E	2004
NYW	Buffalo (Elm)	EC Holding Center	150	9E	2004
NYW	Buffalo (Elm)	Oympic Towers	151	6E	2004
NYW	Buffalo (Elm)	Oympic Towers	151	8E	2004
NYW	Buffalo (Elm)	Marine Atrium	152	35E	2133
NYW	Buffalo (Elm)	Marine Atrium	152	9E	2133
NYW	Buffalo (Elm)	Key Centre	153	1E	3378
NYW	Buffalo (Elm)	Key Centre	153	4E	3378
NYW	Buffalo (Elm)	Market Arcade	154	23E	1547
NYW	Buffalo (Elm)	Market Arcade	154	5E	1547
NYW	Buffalo (Elm)	ECC Athletic Facility	155	1E	2133
NYW	Buffalo (Elm)	ECC Athletic Facility	155	3E	2133
NYW	Buffalo (Elm)	WNED Studios	156	35E	2133
NYW	Buffalo (Elm)	WNED Studios	156	9E	2133
NYW	Buffalo (Elm)	Federal Center	158	35E	2004
NYW	Buffalo (Elm)	Federal Center	158	9E	2004

Table 9 – Part 2: Incident Energy Values, Transformer Energized – New York West, Buffalo (Elm)

Division	System	Spot Network	Vault Number	Cable Number	cal/cm2
NYW	Buffalo (Elm)	First Niagara Arena	159	2E	2133
NYW	Buffalo (Elm)	First Niagara Arena	159	35E	2133
NYW	Buffalo (Elm)	First Niagara Arena	159	9E	2133
NYW	Buffalo (Elm)	Erie County Family Court	161	10E	1547
NYW	Buffalo (Elm)	Erie County Family Court	161	3E	1547
NYW	Buffalo (Elm)	Hampton Inn	163	17E	2004
NYW	Buffalo (Elm)	Hampton Inn	163	6E	2004
NYW	Buffalo (Elm)	Century Centre 2	164	4E	2004
NYW	Buffalo (Elm)	Century Centre 2	164	5E	2004
NYW	Buffalo (Elm)	165MainPlace	165	23E	3378
NYW	Buffalo (Elm)	165MainPlace	165	6E	3378
NYW	Buffalo (Elm)	EC Police Services	166	7E	2004
NYW	Buffalo (Elm)	EC Police Services	166	8E	2004
NYW	Buffalo (Elm)	Niagara Center	167	6E	2133
NYW	Buffalo (Elm)	Niagara Center	167	7E	2133
NYW	Buffalo (Elm)	Health Now	168	5E	3378
NYW	Buffalo (Elm)	Health Now	168	7E	3378
NYW	Buffalo (Elm)	Health Now	168	9E	3378
NYW	Buffalo (Elm)	Uniland	169	8E	1547
NYW	Buffalo (Elm)	Uniland	169	9E	1547
NYW	Buffalo (Elm)	US Federal Courthouse	170	7E	2133
NYW	Buffalo (Elm)	US Federal Courthouse	170	9E	2133
NYW	Buffalo (Elm)	Main-Seneca Prop	82	2E	5389
NYW	Buffalo (Elm)	Main-Seneca Prop	82	3E	5389
NYW	Buffalo (Elm)	Main-Seneca Prop	82	10E	5389
NYW	Buffalo (Elm)	Buffalo News	95	9E	6983
NYW	Buffalo (Elm)	Buffalo News	95	2E	6983
NYW	Buffalo (Elm)	Buffalo News	95	35E	6983
NYW	Buffalo (Elm)	Buffalo News	95	7E	6983

Table 9 – Part 3: Incident Energy Values, Transformer Energized – New York West, Buffalo (Elm)

APPENDIX D

Network Transformer De-Energized

Incident Energy Values in cal/cm^2

Division	System	Spot Network	Vault Number	Cable Number	cal/cm2
NEN	Lynn	195 Market St.	45	1383	8
NEN	Lynn	195 Market St.	45	1384	8
NEN	Lynn	195 Market St.	45	1385	8
NEN	Worcester	Verizon	2	5	33
NEN	Worcester	Verizon	2	6	33
NEN	Worcester	Verizon	2	8A	33
NEN	Worcester	91 Franklin Sq. Worc. Library	56	6A	46.5
NEN	Worcester	91 Franklin Sq. Worc. Library	56	7	46.5
NEN	Worcester	Unum Provident	63	5	164.8
NEN	Worcester	Unum Provident	63	8	164.8
NEN	Worcester	Worcester Center	67	50	46.5
NEN	Worcester	Worcester Center	67	51	46.5
NEN	Worcester	Worcester Center	68	1	8
NEN	Worcester	Worcester Center	68	50	8
NEN	Worcester	Worcester Center	68	51	8
NEN	Worcester	Worcester Center	69	50	46.5
NEN	Worcester	Worcester Center	69	51	46.5
NEN	Worcester	Worcester Center	70	50	51.9
NEN	Worcester	Worcester Center	70	51	51.9
NEN	Worcester	Worcester Center	73	1	30.8
NEN	Worcester	Worcester Center	73	50	30.8
NEN	Worcester	Worcester Center	73	51	30.8
NEN	Worcester	Guaranty Bank & Trust	74	50	376.6
NEN	Worcester	Guaranty Bank & Trust	74	51	376.6
NEN	Worcester	446 Main St. Shawmut Tower	76	1	8
NEN	Worcester	446 Main St. Shawmut Tower	76	50	8
NEN	Worcester	446 Main St. Shawmut Tower	76	51	8
NEN	Worcester	44 Front St.	81	7A	51.9
NEN	Worcester	44 Front St.	81	8	51.9
NEN	Worcester	474 Main St. Neescom/Lightower	82	50	164.8
NEN	Worcester	474 Main St. Neescom/Lightower	82	51	164.8
NEN	Worcester	One Chestnut Place	84	50	46.5
NEN	Worcester	One Chestnut Place	84	51	46.5
NEN	Worcester	600 Main St. Franklin Sq. Tower	85	6A	46.5
NEN	Worcester	600 Main St. Franklin Sq. Tower	85	7A	46.5
NEN	Worcester	Convention Center	86	50	164.8
NEN	Worcester	Convention Center	86	51	164.8
NEN	Worcester	50 Foster St. - DCU Center	90	6	43
NEN	Worcester	50 Foster St. - DCU Center	90	7A	43
NEN	Worcester	50 Foster St. - DCU Center	90	8	43

Table 1: Incident Energy Values, Transformer De-Energized – New England North

Division	System	Spot Network	Vault Number	Cable Number	cal/cm2
NES	Brockton	65 Crescent TelCo	68	20W6	88.5
NES	Brockton	65 Crescent TelCo	96	20W9	88.5
NES	Providence	Industrial Trust	2	1105	8
NES	Providence	Industrial Trust	2	1109	8
NES	Providence	Industrial Trust	2	1113	8
NES	Providence	Telephone Co. (CustOwn)	16	1107	8
NES	Providence	Telephone Co. (CustOwn)	16	1111	8
NES	Providence	Telephone Co. (CustOwn)	16	1127	8
NES	Providence	Telephone Co. (CustOwn)	16	1139	8
NES	Providence	40 Westminster	79	1109	8
NES	Providence	40 Westminster	79	1111	8
NES	Providence	40 Westminster	79	1113	8
NES	Providence	Hospital Trust Tower	83	1105	8
NES	Providence	Hospital Trust Tower	83	1109	8
NES	Providence	Hospital Trust Tower	83	1139	8
NES	Providence	Civic Center	85	1109	30.8
NES	Providence	Civic Center	85	1113	30.8
NES	Providence	Civic Center	85	1139	30.8
NES	Providence	Biltmore	87	1135	164.8
NES	Providence	Biltmore	87	1139	164.8
NES	Providence	Blue Cross	91	1107	164.8
NES	Providence	Blue Cross	91	1111	164.8
NES	Providence	Gilbane	92	1135	51.9
NES	Providence	Gilbane	92	1139	51.9
NES	Providence	Judicial Complex	93	1105	46.5
NES	Providence	Judicial Complex	93	1113	46.5
NES	Providence	Amica	97	1105	164.8
NES	Providence	Amica	97	1139	164.8
NES	Providence	Fleet Tower	102	1107	8
NES	Providence	Fleet Tower	102	1109	8
NES	Providence	Fleet Tower	102	1113	8
NES	Providence	Fleet Tower	102	1135	8
NES	Providence	Shepard Bldg	116	1111	275
NES	Providence	Shepard Bldg	116	1135	275

Table 2: Incident Energy Values, Transformer De-Energized – New England South

Division	System	Spot Network	Vault Number	Cable Number	cal/cm2
NYE	Albany	41 State St.	3321	T8	33
NYE	Albany	41 State St.	3321	T6	33
NYE	Albany	41 State St.	3321	T10	33
NYE	Albany	80 State St.	7010	T6	164.8
NYE	Albany	80 State St.	7011	T8	164.8
NYE	Albany	AE Smith	2261	R7	44.3
NYE	Albany	AE Smith	2262	R5	44.3
NYE	Albany	AE Smith	2263	R2	44.3
NYE	Albany	AE Smith	2265	R12	44.3
NYE	Albany	State Education Bldg	82	R2	14.7
NYE	Albany	State Education Bldg	82	R5	14.7
NYE	Albany	State Education Bldg	5960	R7	14.7
NYE	Albany	Albany Justice Bldg	9713	T10	18
NYE	Albany	Albany Justice Bldg	9714	T6	18
NYE	Albany	Kenmore Hotel	7284	R5	22.1
NYE	Albany	Kenmore Hotel	7285	R15	22.1
NYE	Albany	Verizon Building State St	2767	T10	8
NYE	Albany	Verizon Building State St	2765	T8	33
NYE	Albany	Verizon Building State St	2766	T6	33
NYE	Albany	Twin Towers	4059	R2	80.2
NYE	Albany	Twin Towers	4059	R1	80.2
NYE	Albany	Twin Towers	4059	R11	80.2
NYE	Albany	Twin Towers	4059	R15	80.2

Table 3: Incident Energy Values, Transformer De-Energized – New York East, Albany

Division	System	Spot Network	Vault Number	Cable Number	cal/cm2
NYE	Schenectady	Bowtie Theater	10058	3	13
NYE	Schenectady	Bowtie Theater	10057	6	13
NYE	Schenectady	NYS DOT	9570	3	18
NYE	Schenectady	NYS DOT	9572	6	18
NYE	Schenectady	Proctors Theater	9890	8	34
NYE	Schenectady	Proctors Theater	9891	7	34
NYE	Schenectady	Proctors Theater	9892	6	34
NYE	Schenectady	Wallace Bldg	1830	7	164.8
NYE	Schenectady	Wallace Bldg	1831	3	164.8
NYE	Troy	Grim Mall	1246	11	275
NYE	Troy	Grim Mall	1247	7	275

Table 4: Incident Energy Values, Transformer De-Energized – New York East, Schenectady & Troy

Division	System	Spot Network	Vault Number	Cable Number	cal/cm2
NYE	Albany 34.5	Albany Pearl St Associates	9412	R8	53
NYE	Albany 34.5	Albany Pearl St Associates	9413	R10	53
NYE	Albany 34.5	Albany Pearl St Associates	9414	R14	53
NYE	Albany 34.5	SUNY Plaza	6227	R8	130.9
NYE	Albany 34.5	SUNY Plaza	6228	R10	130.9
NYE	Albany 34.5	SUNY Plaza	6229	R9	130.9
NYE	Albany 34.5	NYS Comptroller Building	9406	R8	43
NYE	Albany 34.5	NYS Comptroller Building	9407	R9	43
NYE	Albany 34.5	NYS Comptroller Building	9408	R10	43
NYE	Albany 34.5	Columbia	9724	R35	23
NYE	Albany 34.5	Columbia	9723	R8	23
NYE	Albany 34.5	Charter One Bank	6121	R10	88.5
NYE	Albany 34.5	Charter One Bank	6122	R8	88.5
NYE	Albany 34.5	Crowne Plaza	6767	R9	275
NYE	Albany 34.5	Crowne Plaza	6768	R14	275
NYE	Albany 34.5	NYS Dorm Authority	9022	R10	23
NYE	Albany 34.5	NYS Dorm Authority	9023	R8	23
NYE	Albany 34.5	Dewitt Clinton	6219	R8	88.5
NYE	Albany 34.5	Dewitt Clinton	6220	R10	88.5
NYE	Albany 34.5	Federal Bldg	6054	R14	275
NYE	Albany 34.5	Federal Bldg	6055	R9	275
NYE	Albany 34.5	NBT Bank	5479	R14	275
NYE	Albany 34.5	NBT Bank	5480	R9	275
NYE	Albany 34.5	Kiernan Plaza	7274	R14	28
NYE	Albany 34.5	Kiernan Plaza	7273	R9	28
NYE	Albany 34.5	Omni Bldg	8013	R9	18
NYE	Albany 34.5	Omni Bldg	8014	R14	18
NYE	Albany 34.5	Omni Plaza	7436	R10	18
NYE	Albany 34.5	Omni Plaza	7437	R8	18
NYE	Albany 34.5	Ten Eyck Bldg	6147	R8	130.9
NYE	Albany 34.5	Ten Eyck Bldg	6148	R10	130.9
NYE	Albany 34.5	Ten Eyck Bldg	6149	R9	130.9

Table 5: Incident Energy Values, Transformer De-Energized – New York East, Albany 34.5kV

Division	System	Spot Network	Vault Number	Cable Number	cal/cm2
NYC	Utica	M&T Bank	N-28-2	65144	17
NYC	Utica	M&T Bank	N-28-3	65145	17
NYC	Utica	NYS Office Bldg	N-3057	65147	34
NYC	Utica	NYS Office Bldg	N-3058	65145	34
NYC	Utica	NYS Office Bldg	N-3059	65144	34
NYC	Utica	Oneida Office Bldg	N-3060	65144	32
NYC	Utica	Oneida Office Bldg	N-3061	65146	32
NYC	Utica	Oneida Office Bldg	N-3062	65147	32
NYC	Watertown	Dulles State Ofc Bldg	N-6003	74860	18
NYC	Watertown	Dulles State Ofc Bldg	N-7403	74874	18

Table 6: Incident Energy Values, Transformer De-Energized – New York Central, Utica & Watertown

Division	System	Spot Network	Vault Number	Cable Number	cal/cm2
NYC	Syracuse (Ash)	Bryant & Stratton	N-44109	22344	13
NYC	Syracuse (Ash)	Bryant & Stratton	N-47108	22347	13
NYC	Syracuse (Ash)	Financial One	N-42181	22342	17
NYC	Syracuse (Ash)	Financial One	N-45180	22345	17
NYC	Syracuse (Ash)	Galleries	N-40198	22340	34
NYC	Syracuse (Ash)	Galleries	N-42199	22342	34
NYC	Syracuse (Ash)	Galleries	N-45200	22345	34
NYC	Syracuse (Ash)	Herald Journal	N-40220	22340	34
NYC	Syracuse (Ash)	Herald Journal	N-43219	22343	34
NYC	Syracuse (Ash)	Herald Journal	N-48218	22348	34
NYC	Syracuse (Ash)	Herald Journal (100)	N-40124	22340	34
NYC	Syracuse (Ash)	Herald Journal (100)	N-43125	22343	34
NYC	Syracuse (Ash)	Herald Journal (100)	N-48126	22348	34
NYC	Syracuse (Ash)	HSBC	N-41152	22341	32
NYC	Syracuse (Ash)	HSBC	N-42151	22342	32
NYC	Syracuse (Ash)	HSBC	N-45150	22345	32
NYC	Syracuse (Ash)	James Square	N-44186	22344	18
NYC	Syracuse (Ash)	James Square	N-49187	22349	18
NYC	Syracuse (Ash)	NMPC	N-42194	22342	17
NYC	Syracuse (Ash)	NMPC	N-43195	22343	17
NYC	Syracuse (Ash)	NMPC Parking Lot	N-41153	22341	14.7
NYC	Syracuse (Ash)	NMPC Parking Lot	N-43154	22343	34
NYC	Syracuse (Ash)	NMPC Parking Lot	N-48155	22348	34
NYC	Syracuse (Ash)	Onondaga County Jail	N-45213	22345	18
NYC	Syracuse (Ash)	Onondaga County Jail	N-49212	22349	18
NYC	Syracuse (Ash)	Sibley's Garage	N-40128	22340	32
NYC	Syracuse (Ash)	Sibley's Garage	N-43129	22343	32
NYC	Syracuse (Ash)	Sibley's Garage	N-49130	22349	32
NYC	Syracuse (Ash)	Washington Station	N-40223	22340	17
NYC	Syracuse (Ash)	Washington Station	N-46224	22346	17

Table 7: Incident Energy Values, Transformer De-Energized – New York Central, Syracuse (Ash St.)

Division	System	Spot Network	Vault Number	Cable Number	cal/cm2
NYC	Syracuse (Temple)	Atrium	N-49147	24349	32
NYC	Syracuse (Temple)	Atrium	N-56146	24356	32
NYC	Syracuse (Temple)	Atrium	N-58145	24358	32
NYC	Syracuse (Temple)	AXA (Mony Plaza)	N-53097	24353	8
NYC	Syracuse (Temple)	AXA (Mony Plaza)	N-49100	24349	36.9
NYC	Syracuse (Temple)	AXA (Mony Plaza)	N-54099	24354	36.9
NYC	Syracuse (Temple)	AXA (Mony Plaza)	N-57096	24357	36.9
NYC	Syracuse (Temple)	AXA (Mony Plaza)	N-58101	24358	36.9
NYC	Syracuse (Temple)	Onon. Co. Steam Plant	N-53177	24353	34
NYC	Syracuse (Temple)	Onon. Co. Steam Plant	N-54176	24354	34
NYC	Syracuse (Temple)	Onon. Co. Steam Plant	N-58178	24358	34
NYC	Syracuse (Temple)	Chimes Bldg	N-50134	24350	18
NYC	Syracuse (Temple)	Chimes Bldg	N-53060	24353	18
NYC	Syracuse (Temple)	Civic Center	N-50161	24350	34
NYC	Syracuse (Temple)	Civic Center	N-53162	24353	34
NYC	Syracuse (Temple)	Civic Center	N-54163	24354	34
NYC	Syracuse (Temple)	Clinton Properties	N-49168	24349	32
NYC	Syracuse (Temple)	Clinton Properties	N-56167	24356	32
NYC	Syracuse (Temple)	Clinton Properties	N-58169	24358	32
NYC	Syracuse (Temple)	Convention Center	N-50211	24350	14.7
NYC	Syracuse (Temple)	Convention Center	N-54209	24354	14.7
NYC	Syracuse (Temple)	Convention Center	N-58210	24358	34
NYC	Syracuse (Temple)	Salvation Army	N-53118	24353	18
NYC	Syracuse (Temple)	Salvation Army	N-57119	24357	18
NYC	Syracuse (Temple)	Federal Bldg	N-49166	24349	34
NYC	Syracuse (Temple)	Federal Bldg	N-56164	24356	34
NYC	Syracuse (Temple)	Federal Bldg	N-58165	24358	34
NYC	Syracuse (Temple)	Greystone Sq	N-49202	24349	17
NYC	Syracuse (Temple)	Greystone Sq	N-57201	24357	17
NYC	Syracuse (Temple)	Crowne Plaza	N-54114	24354	18
NYC	Syracuse (Temple)	Crowne Plaza	N-57115	24357	18
NYC	Syracuse (Temple)	Lincoln Bank	N-49140	24349	34
NYC	Syracuse (Temple)	Lincoln Bank	N-56142	24356	34
NYC	Syracuse (Temple)	Lincoln Bank	N-58141	24358	34
NYC	Syracuse (Temple)	Madison Manor	N-54174	24354	17
NYC	Syracuse (Temple)	Madison Manor	N-57175	24357	17
NYC	Syracuse (Temple)	One Park Place	N-54190	24354	18
NYC	Syracuse (Temple)	One Park Place	N-58191	24358	18
NYC	Syracuse (Temple)	University Health Care	N-54159	24354	17
NYC	Syracuse (Temple)	University Health Care	N-57158	24357	17
NYC	Syracuse (Temple)	Syrtel	N-50135	24350	34
NYC	Syracuse (Temple)	Syrtel	N-53137	24353	34
NYC	Syracuse (Temple)	Syrtel	N-58170	24358	34
NYC	Syracuse (Temple)	W. Washington (AT&T)	N-49203	24349	17
NYC	Syracuse (Temple)	W. Washington (AT&T)	N-56205	24356	17

Table 8: Incident Energy Values, Transformer De-Energized – New York Central, Syracuse (Temple St.)

Division	System	Spot Network	Vault Number	Cable Number	cal/cm2
NYW	Buffalo (Elm)	Buffalo Library	103	16E	33
NYW	Buffalo (Elm)	Buffalo Library	103	2E	33
NYW	Buffalo (Elm)	Buffalo Library	103	35E	33
NYW	Buffalo (Elm)	Erie County Court	115	35E	33
NYW	Buffalo (Elm)	Erie County Court	115	3E	33
NYW	Buffalo (Elm)	Erie County Court	115	5E	33
NYW	Buffalo (Elm)	Merchants Mutual	116	10E	88.5
NYW	Buffalo (Elm)	Merchants Mutual	116	8E	88.5
NYW	Buffalo (Elm)	M&T Bank	119	1E	33
NYW	Buffalo (Elm)	M&T Bank	119	23E	33
NYW	Buffalo (Elm)	M&T Bank	119	2E	33
NYW	Buffalo (Elm)	120MainPlace	120	23E	22.1
NYW	Buffalo (Elm)	120MainPlace	120	3E	88.5
NYW	Buffalo (Elm)	Avant Building	121	6E	14.7
NYW	Buffalo (Elm)	Avant Building	121	17E	70.3
NYW	Buffalo (Elm)	Avant Building	121	8E	70.3
NYW	Buffalo (Elm)	122Main Place	122	6E	22.1
NYW	Buffalo (Elm)	122Main Place	122	8E	88.5
NYW	Buffalo (Elm)	123Main Place	123	3E	8
NYW	Buffalo (Elm)	123Main Place	123	1E	33
NYW	Buffalo (Elm)	123Main Place	123	23E	33
NYW	Buffalo (Elm)	124Main Place	124	10E	8.9
NYW	Buffalo (Elm)	124Main Place	124	1E	44.3
NYW	Buffalo (Elm)	124Main Place	124	3E	44.3
NYW	Buffalo (Elm)	124Main Place	124	8E	44.3
NYW	Buffalo (Elm)	Rath Bldg	126	6E	8.9
NYW	Buffalo (Elm)	Rath Bldg	126	10E	44.3
NYW	Buffalo (Elm)	Rath Bldg	126	3E	44.3
NYW	Buffalo (Elm)	Rath Bldg	126	8E	44.3
NYW	Buffalo (Elm)	City Hall	128	17E	27.1
NYW	Buffalo (Elm)	City Hall	128	35E	27.1
NYW	Buffalo (Elm)	City Hall	128	5E	27.1
NYW	Buffalo (Elm)	HSBC Basement	131	10E	76
NYW	Buffalo (Elm)	HSBC Basement	131	23E	76
NYW	Buffalo (Elm)	HSBC Basement	131	2E	76
NYW	Buffalo (Elm)	HSBC Basement	131	3E	76
NYW	Buffalo (Elm)	HSBC Penthouse	132	10E	70.3
NYW	Buffalo (Elm)	HSBC Penthouse	132	23E	70.3
NYW	Buffalo (Elm)	HSBC Penthouse	132	3E	70.3

Table 9 – Part 1: Incident Energy Values, Transformer De-Energized – New York West, Buffalo (Elm)

Division	System	Spot Network	Vault Number	Cable Number	cal/cm2
NYW	Buffalo (Elm)	Convention Center	134	18E	18
NYW	Buffalo (Elm)	Convention Center	134	35E	18
NYW	Buffalo (Elm)	Buffalo City Court	135	35E	33
NYW	Buffalo (Elm)	Buffalo City Court	135	5E	33
NYW	Buffalo (Elm)	Buffalo City Court	135	7E	33
NYW	Buffalo (Elm)	BAC	139	5E	88.5
NYW	Buffalo (Elm)	BAC	139	9E	88.5
NYW	Buffalo (Elm)	NFTA	140	1E	18
NYW	Buffalo (Elm)	NFTA	140	2E	18
NYW	Buffalo (Elm)	Adams Mark	141	35E	28
NYW	Buffalo (Elm)	Adams Mark	141	7E	28
NYW	Buffalo (Elm)	ECC	142	1E	18
NYW	Buffalo (Elm)	ECC	142	2E	18
NYW	Buffalo (Elm)	Gold Dome	143	4E	28
NYW	Buffalo (Elm)	Gold Dome	143	5E	28
NYW	Buffalo (Elm)	Bank of America	144	1E	18
NYW	Buffalo (Elm)	Bank of America	144	2E	18
NYW	Buffalo (Elm)	Prudential	148	8E	17
NYW	Buffalo (Elm)	Prudential	148	9E	17
NYW	Buffalo (Elm)	Hyatt Regency	149	4E	18
NYW	Buffalo (Elm)	Hyatt Regency	149	6E	18
NYW	Buffalo (Elm)	EC Holding Center	150	35E	17
NYW	Buffalo (Elm)	EC Holding Center	150	9E	17
NYW	Buffalo (Elm)	Oympic Towers	151	6E	17
NYW	Buffalo (Elm)	Oympic Towers	151	8E	17
NYW	Buffalo (Elm)	Marine Atrium	152	35E	18
NYW	Buffalo (Elm)	Marine Atrium	152	9E	18
NYW	Buffalo (Elm)	Key Centre	153	1E	28
NYW	Buffalo (Elm)	Key Centre	153	4E	28
NYW	Buffalo (Elm)	Market Arcade	154	23E	8.5
NYW	Buffalo (Elm)	Market Arcade	154	5E	8.5
NYW	Buffalo (Elm)	ECC Athletic Facility	155	1E	18
NYW	Buffalo (Elm)	ECC Athletic Facility	155	3E	18
NYW	Buffalo (Elm)	WNED Studios	156	35E	18
NYW	Buffalo (Elm)	WNED Studios	156	9E	18
NYW	Buffalo (Elm)	Federal Center	158	35E	17
NYW	Buffalo (Elm)	Federal Center	158	9E	17

Table 9 – Part 2: Incident Energy Values, Transformer De-Energized – New York West, Buffalo (Elm)

Division	System	Spot Network	Vault Number	Cable Number	cal/cm2
NYW	Buffalo (Elm)	First Niagara Arena	159	2E	14.7
NYW	Buffalo (Elm)	First Niagara Arena	159	35E	14.7
NYW	Buffalo (Elm)	First Niagara Arena	159	9E	34
NYW	Buffalo (Elm)	Erie County Family Court	161	10E	13
NYW	Buffalo (Elm)	Erie County Family Court	161	3E	13
NYW	Buffalo (Elm)	Hampton Inn	163	17E	17
NYW	Buffalo (Elm)	Hampton Inn	163	6E	17
NYW	Buffalo (Elm)	Century Centre 2	164	4E	17
NYW	Buffalo (Elm)	Century Centre 2	164	5E	17
NYW	Buffalo (Elm)	165MainPlace	165	23E	28
NYW	Buffalo (Elm)	165MainPlace	165	6E	28
NYW	Buffalo (Elm)	EC Police Services	166	7E	17
NYW	Buffalo (Elm)	EC Police Services	166	8E	17
NYW	Buffalo (Elm)	Niagara Center	167	6E	18
NYW	Buffalo (Elm)	Niagara Center	167	7E	18
NYW	Buffalo (Elm)	Health Now	168	5E	53
NYW	Buffalo (Elm)	Health Now	168	7E	53
NYW	Buffalo (Elm)	Health Now	168	9E	53
NYW	Buffalo (Elm)	Uniland	169	8E	13
NYW	Buffalo (Elm)	Uniland	169	9E	13
NYW	Buffalo (Elm)	US Federal Courthouse	170	7E	18
NYW	Buffalo (Elm)	US Federal Courthouse	170	9E	18
NYW	Buffalo (Elm)	Main-Seneca Prop	82	2E	8
NYW	Buffalo (Elm)	Main-Seneca Prop	82	3E	8
NYW	Buffalo (Elm)	Main-Seneca Prop	82	10E	33
NYW	Buffalo (Elm)	Buffalo News	95	9E	8
NYW	Buffalo (Elm)	Buffalo News	95	2E	20.8
NYW	Buffalo (Elm)	Buffalo News	95	35E	20.8
NYW	Buffalo (Elm)	Buffalo News	95	7E	20.8

Table 9 – Part 3: Incident Energy Values, Transformer De-Energized – New York West, Buffalo (Elm)

Division 2-4 (Electric)
Volt/Var Program

Request:

Provide a detailed explanation of the Volt/Var demonstration project. Indicate National Grid's justification and expectation for this demonstration project. Include a project scope, project schedule, budget, list of both capital and expense items that comprise the project budget, anticipated up fit costs, and internal resource requirements.

Response:

The benefits of distribution feeder reactive support and voltage regulation are well known and individual capacitor installations and voltage regulators can be justified for reasons of voltage improvement and/or capacity release. However, National Grid has not evaluated the potential benefits of Volt/Var control systems and strategies utilizing centralized control algorithms. National Grid is of the opinion that such a project is recommended at this time for the following reasons:

- Determine the potential operational benefits from these systems as stated by the manufacturers that would improve service to customers (please see the response to Electric ISR Division 2-7 on the potential savings from these systems.);
- Understand potential synergies with other rapidly developing uses of advanced technology on power distribution systems (Advanced Distribution Automation, Distribution Management Systems, and Communications Infrastructure) and/or areas where these technologies may work in opposition to one another;
- Understand how application of these systems could be integrated with existing guidelines to meet current objectives for Volt/Var infrastructure (e.g. effective utilization of system capacity and meeting NE ISO system power factor performance guidelines);
- Guide system planners on potential benefits from deployment (set priorities, establish planning guidance, detail an expansion program, etc.) including clear direction on justification (cost/benefit) of infrastructure development costs; and
- Understand system performance when distribution system is out of normal configuration.

Division 2-4 (Electric), page 2
Volt/Var Program

Other benefits for the State of Rhode Island include the selection of a RI-based company to provide this technology. In addition, this project will complement evaluation projects in other National Grid jurisdictions that will improve National Grid's knowledge of important new technological offerings to the industry and potential application for customer benefit in RI. This includes National Grid's Smart Grid and Distribution Automation pilot in Worcester, MA as well as the Smart Grid technology project in upstate New York.

Conceptual scope, schedule, budget:

The demonstration project is preliminarily set at six 12.47 kV feeders supplied from two substations. One substation (Tower Hill #88) is supplied via a Load Tap Changing (LTC) transformer and the other (Putnam Pike #38) via single phase voltage regulators.

Estimated total number of devices to be included in project:

Field Devices requiring communications:
Capacitor Banks - 32
Line Regulators - 10 single phase units (3 banks of 3 and 1 single unit) - 4 locations
Line Voltage Monitors (UtiliData device) – 10

Substation Devices – to be accessed via EMS:
Substation capacitor banks – 2
Single phase line regulators – 9
LTC transformers – 1

UtiliData Core Unit - 1

The Company is only in the very preliminary stages of conceptual project design, and thus estimated costs and schedule are order of magnitude only. At this point the demonstration project would be expected to cost between $3 million and $6 million depending in part on the need to replace versus upgrade field devices. Given the need for detailed planning and design engineering, it is likely that material procurement and construction costs would not begin for 9-12 months. Our current plan proposes $1.5 million of spending during FY14 with the remainder of project spending occurring in FY15. Once the detailed planning and design engineering are complete, a project-grade estimate and schedule can be prepared. A breakdown into capital and expense will not be available until the project-grade estimates have been prepared. This demonstration project will use existing engineering resources.

Division 2-5 (Electric)
Volt/Var Program

Request:

Does the current Volt/Var demonstration project as envisioned by National Grid require significant technology and communications improvements to deploy?

Response:

All field equipment controls would require upgrades to the current advanced control specification to support advanced functionality and communications. Based on the outcome of the detailed planning process, some or all of the capacitor banks may require replacement and/or relocation. A preliminary review of the communications requirements is underway with a range of possible solutions from expanding systems currently in place to establishing a new communications system. The communications infrastructure planning work is ongoing. As stated in Electric ISR Division 2-4, detailed planning and design engineering is required before a firm project scope can be established.

Division 2-6 (Electric)
Volt/Var Program

Request:

Are these technology improvements guided or directed by a utility-wide technology plan? Provide details of the technology planning process used to establish the need and justification for this advanced grid technology deployment.

Response:

National Grid does have a planning philosophy that investments should be adaptable to potential future conditions as appropriate. These can include customer use as well as technology options. With regard to technology options, the Company detailed the reasons it feels such a project is required at this time in response to Electric ISR Division 2-4.

Division 2-7 (Electric)
Volt/Var Program

Request:

Provide the analysis that establishes the Cost/Benefit that National Grid anticipates for the Volt/Var Management Demonstration Project.

Response:

As previously noted, National Grid has not yet performed a trial to demonstrate the potential benefits of Volt/Var control systems and strategies utilizing centralized control algorithms. While the vendor, UtiliData, can claim a 3 percent to 7 percent reduction in system peaks, the key objective of this demonstration project is to gain the knowledge that would enable benefit analysis for justification of future deployments. Potential benefits (with measurement/evaluation including the development of system performance base lines in advance of deployment) that National Grid hopes to demonstrate are as follows:

- Loss reduction (peak demand and energy loss reduction) - to be evaluated with system models.
- Peak demand reduction - At individual feeder and substation levels (demonstrated with on/off experiments to avoid need for peak load adjustments (e.g.. for weather, spot load growth/reduction, etc.).
- Capacity release - Improved compliance with internal planning guidelines requiring feeder load (as measured at station bus) be as close to unity as possible during peak load conditions.
- System voltage performance improvement - Quantitative assessment, detail any reduction in customer voltage complaints observed; Qualitative assessment, ability to respond to customer complaints and/or identify and respond to excursions in advance of customer calls.
- Operational Efficiencies - Identify and estimate reduction in annual maintenance costs (seasonal capacitor switching, annual capacitor inspections, regulator/LTC maintenance, etc.).
- Adherence to NE-ISO power factor performance requirements - Improved methods in both achieving and demonstrating (measuring) compliance.
- Customer Energy Savings - Trial would rely on methods developed by the chosen vendor to measure/estimate such savings.

Division 2-8 (Electric)
Volt/Var Program

Request:

How does this proposed program provide benefits greater than the traditional Var control methods already employed by National Grid, which are based upon capacitor optimization studies, for the additional cost?

Response:

The present VAR control methods employed at National Grid consist primarily of time-clock based controls (sometimes with voltage and temperature overrides) and fixed banks. Typically, the time-based banks are designed to correct the feeder to unity power factor during peak conditions. Due to this design, some of the banks must be manually taken out of service during off-peak periods to prevent excessive leading power factor (typically spring and fall) and manually put back in service during peak (typically summer and winter). This bi-annual switching process is time-consuming for the Company's operations personnel.

A few installations of more intelligent controls are being deployed using primary voltage-sensing and kVAR, kW and/or voltage measured locally to control the operation of the capacitor bank. These more intelligent controls are expected to improve upon the performance of the time-based controls by more closely matching the feeder VAR requirements at all times of the day and throughout the seasons. However, they are still based on local control settings and cannot be centrally controlled for the type of coordinated response needed for volt/var optimization.

The proposed demonstration project is expected to further enhance the intelligent controls by providing centralized control to intelligently switch the banks to minimize regulator travel and capacitor bank switch operations while maintaining control of both the feeder power factor and voltage profiles within the programmed parameters. Additionally, this system is expected to better manage voltage reduction events and provide measurement and reporting of system performance from a voltage and power factor perspective at all times. The demonstration project is designed to allow National Grid to gain experience with this more advanced method to centrally control the power factor and voltage performance of distribution feeders.

Each of the above methods incrementally improves National Grid's ability to control the amount and timing of VAR support on the system to support the release of excess feeder capacity, better control feeder voltage profile, and reduce feeder losses during peak as well as other times of the day and throughout the seasonal changes in feeder loading.

Division 2-8 (Electric), page 2
Volt/Var Program

In sum, the proposed demonstration project presents a significant opportunity to explore the benefits of centralized capacitor control when compared to the current methods primarily used at National Grid, which consist of time-based controls. The full extent of these expected benefits is not known at the present time, and the intent of this project is to quantify these benefits and allow comparison of costs to benefits from each technology option.

Division 2-9 (Electric)
Volt/Var Program

Request:

Has National Grid discussed a Volt/Var program demonstration project with ABB, Siemens, Cooper Power Systems or other major vendors to determine if they will participate in such a program for free, or at a substantially discounted price similar to what these types of vendors have done for other major utilities in the United States? If so, what vendors were contacted, what were the results, and provide an explanation of those discussions?

Response:

The Company has not discussed any demonstration projects with the companies listed in the question above. Our understanding of the activities of this technology in the industry has come by way of collective experience gained from industry publications, trade shows, conferences, and informal discussions with equipment vendors and/or representatives from the utilities. The Company has been working with UtiliData at this point because of the unique opportunity to work with a local provider of such systems willing to work with us at no cost to develop order of magnitude cost estimates that can be used for "directional" discussions. Comparatively to what the Company has learned, National Grid has been encouraged by the technology solution that UtiliData provides for Volt/Var control systems and strategies utilizing centralized control algorithms. In particular, National Grid is of the opinion that UtiliData's system, which employs direct device control features and the use of high accuracy primary voltage sensing, increases the potential for the system to deliver substantial benefits.

Division 2-10 (Electric)
Volt/Var Program

Request:

Has National Grid discussed with major vendors the fact that there is a marginal cost benefit to a Volt/Var program if, in fact any cost benefit? If so, what vendors were contacted, what were the results, and provide an explanation of those discussions?

Response:

Please reference the Company's response to Electric ISR Division 2-7 for the potential benefits that the Company is proposing to evaluate. At this time, National Grid does not have enough information on or experience with Volt/Var control systems and strategies utilizing centralized control algorithms to estimate/quantify benefits in detail. While the vendor, UtiliData, can claim a 3 percent to 7 percent reduction in system peaks, there have been no discussions with vendors that have characterized potential cost benefits as "marginal." National Grid hopes to gain knowledge from the demonstration project that would enable quantitative benefit analysis for justification of future deployments. Based on actual demonstration project performance results, it is possible that additional deployment would either not be proposed, could be proposed in a fashion that is complimentary to and in association with other infrastructure development projects, or could be proposed as a "stand alone" initiative for the benefits to be derived.

Division 2-11 (Electric)
Volt/Var Program

Request:

Has National Grid discussed the results of Volt/Var programs with other major electric utilities or other industry research sectors to determine if other utility demonstration programs would translate into an appropriate analysis for National Grid without expending 1.5 to 6 million dollars for a demonstration project? If so, provide and explanation of those discussions. If not, explain why this would not be National Grid's first choice for the initial assessments on a Volt/Var program.

Response:

National Grid has not employed formal survey/outreach to evaluate the results of Volt/Var programs with other major electric utilities. Instead, our understanding of the activities of other utilities has come by way of collective experience gained from industry publications, trade shows, conferences, and informal discussions with equipment vendors and/or representatives from the utilities. National Grid has acquired and reviewed research on the topic sponsored by the Electric Power Research Institute ("EPRI"). The most recent EPRI research document reviewed by National Grid in association with our effort to develop the demonstration project is titled "Design and Assessment of Volt-VAR Optimization Systems," dated December 2011.

It is National Grid's opinion that, when trying to assess the learning opportunity offered by a specific demonstration project, it can be misleading to compare the metrics that describe one utility's demonstration to those of another. It is not unlike the difficulty comparing system performance metrics between utilities of similar size without more detailed consideration of each company's individual characteristics such as construction standards, equipment loading guidelines, presence and type of vegetation that impacts performance, climate, and so on. In a similar way, every company's demonstration project experience is unique since each has unique geographies, system planning, design, and operations guidelines and/or practices. For this reason, National Grid is of the opinion that a demonstration of Volt/Var control systems and strategies utilizing centralized control algorithms within its service territory is required to gain knowledge that would enable quantitative benefit analysis for justification of future deployments.

Division 2-12 (Electric)
Volt/Var Program

Request:

Considering National Grid's delays in implementing the flood mitigation program, the continued study and adjustments in the flood mitigation program, and the tens of millions of dollars of capital investment and resources this program will require, explain why National Grid feels that now is an appropriate time to begin a multi-million dollar Volt/Var demonstration project.

Response:

The primary drivers for delays in the initial flood mitigation projects were permitting and licensing issues regarding substation siting, which have since been resolved for those particular projects. Necessary permissions regarding siting of substation facilities have historically been difficult and time consuming. The Company always desires to move all of these large projects, both flood mitigation and capacity related, forward as expeditiously as possible. However, it is not unexpected that spending on these projects will be impacted by such issues going forward.

The justification for a demonstration project at this time was as stated in response to Electric ISR Division 2-4.

Division 2-13 (Electric)
Volt/Var Program

Request:

Explain why National Grid believes that it should begin a Volt/Var demonstration program rather than utilizing the data collected by other utilities across the country that have begun and/or completed Volt/Var programs or demonstration projects.

Response:

Please refer to National Grid's response to Electric ISR Division 2-11 which addresses the question posed in this data request.

Prepared by or under the supervision of: Jennifer L. Grimsley

Division 2-14 (Electric)
Volt/Var Program

Request:

Did National Grid make any commitments to UtilitData either prior to or as part of UtiliData's transfer of its corporate offices from the west coast to Rhode Island?

Response:

National Grid has made no commitments of any type or at any time to UtiliData.

Division 2-15 (Electric)
Volt/Var Program

Request:

Has there been any execution of purchase orders or other commitments to UtiliData that have already transpired as they relate to the Volt/Var program or any other program that would require National Grid to already have commitments and, if so, what commitments were made and why?

Response:

No purchase orders or other commitments have been made to UtiliData related to the Volt/Var demonstration project or any other project or program.

Division 2-16 (Electric)
Volt/Var Program

Request:

During the November 29, 2012 conference discussion concerning the 2014 FY ISR Plan, National Grid's engineers admitted that there is likely a marginal cost benefit, if in fact any cost benefit, associated with a Volt/Var program. Considering this belief among the engineers at National Grid and considering the significant capital investments required in flood mitigation programs, capacity programs and O&M programs, all during a significant and extended economic downturn, explain why National Grid would want to begin an expensive demonstration program when both National Grid and the industry's belief is there is little if any economic benefit in such programs.

Response:

The Company did not intend to leave those attending the conference mentioned with the impression stated in this information request. National Grid intended to convey to those in attendance that benefits of application of such systems within National Grid's service territory are unclear but, in the Company's opinion, need to be evaluated. The reasons for pursuing the demonstration project have been provided previously in response to Electric ISR Division 2-4. The benefits that National Grid hopes to demonstrate are detailed in response to Electric ISR Division 2-7. The Company agrees that larger volume deployments as being conducted at some other utilities would not be appropriate at National Grid without the benefit of experience to be gained from a more limited demonstration project of the type being proposed. It is National Grid's opinion that, when trying to assess the learning opportunity offered by others, it can be misleading to compare the metrics that describe one utility's demonstration to those of another (Refer to Electric ISR Division 2-11).

Division 2-17 (Electric)
Volt/Var Program

Request:

National Grid has indicated, particularly during discussions, that this demonstration program could cost upwards of 6 million dollars. To the extent that National Grid and the Division agree that there is any benefit to any demonstration program, will National Grid provide a defined circuit or circuits and substation which the demonstration program will be applied to and provide a detailed limitation on the total investment in such a program?

Response:

Please refer to Electric ISR Division 2-4 for the preliminary scope of the demonstration project. The demonstration project is preliminarily set at six 12.47 kV feeders supplied from two substations, with costs estimated to range between $3 million and $6 million. If the estimated cost were to exceed $6 million, the project scope could be reduced by removing feeders from the Putnam Pike substation. As indicted in previous responses, the Company is only in the very preliminary stages of conceptual project design; as such estimated costs and schedule are order of magnitude only. Hence, the reason for providing a cost range. It is National Grid's opinion that the minimum scope for the demonstration project would be three feeders from Tower Hill #88 and one feeder from Putnam Pike #38. Additionally, if estimated costs are within the expected range, National Grid would prefer to maintain the project scope as defined with all six feeders. However, as the Company finishes detailed engineering and design, the final cost of the original scope could come in less than the upper range. Cost could be reduced further by the scope change described above.

Division 2-18 (Electric)
Volt/Var Program

Request:

What engineering resources will be required for this program? Explain why National Grid would want to divert its engineering resources to a demonstration program when it has important reliability and safety programs that should be implemented.

Response:

The Company has presented a plan that includes an appropriate level of investment to continue to provide safe and reliable service to customers while balancing cost concerns. Appropriate levels of engineering resources will be available to deliver this capital plan and no resources will be diverted from the plan to assist in the Volt/Var optimization program. However, the Company employs resources who actively investigate the application of new utility technologies on the distribution system in a continuing effort to improve service to customers with the application of the best available technology. In order to apply this technology, the Company must test the technology's effectiveness on its system as discussed in other Data Responses. The resources who perform this function are separate from the engineering resources who will work on the plan.

Division 2-19 (Electric)
Volt/Var Program

Request:

Explain how National Grid justifies implementing the Volt/Var program over other reliability or safety enhancements to National Grid's system when even after a demonstration program, it is likely to have produced no tangible benefits.

Response:

In response to Electric ISR Division 2-4, National Grid details the reasons for pursuing the demonstration project at this time. In response to Electric ISR Division 2-7, National Grid details the benefits it hopes to demonstrate.

Division 2-20 (Electric)
Volt/Var Program

Request:

Indicate the utility metrics that National Grid will expect to improve upon as a result of this demonstration project. Are these performance measurements currently tracked by the Company?

Response:

The list below outlines the utility metrics National Grid expects to improve through the demonstration project:

- Feeder peak demand is expected to be reduced. Feeder peak demand is tracked and the expected benefits can be demonstrated by enabling/disabling the centralized control.

- Feeder capacity is expected to be released resulting in improved compliance with internal planning guidelines requiring feeder load (as measured at station bus) be as close to unity as possible during peak load conditions.

- Feeder power factor is expected to be improved during peak as well as off-peak conditions. Area level power factor compliance is tracked and reported to the NE-ISO as part of the NE-ISO system power factor performance guidelines.

- Feeder voltage performance is expected to be improved (flattened). Currently this is only measured at the substation bus. This project will add monitoring points along the feeder supporting more granular monitoring. A reduction in any customer voltage complaints is expected, complaints are recorded in the PowerOn outage Management system.

- Feeder losses are expected to be reduced due to improved peak and average power factor and flattening the feeder voltage profile. These losses are not currently tracked but can be estimated via system modeling software.

Division 2-21 (Electric)
Volt/Var Program

Request:

Provide a comprehensive listing of both the reliability and the safety benefits that National Grid believes arise out of a Volt/Var program, and what sources or information National Grid is relying on for this list.

Response:

In response to Electric ISR Division 2-7, National Grid details the benefits it hopes to demonstrate with the Volt/Var demonstration project. This list of potential benefits was compiled by National Grid engineers based on an understanding of the operational characteristics of the devices that will be managed by a centralized control algorithm and the enhancements to system performance that centralized control might deliver. Quantification of benefits is an objective of the demonstration project. The benefits being pursued can be characterized as those that optimize reliable and safe, electric grid operations.

Prepared by or under the supervision of: Jennifer L. Grimsley

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Division 2-22 (Electric)
Statutory/Regulatory

Request:

During the November 29, 2012 conference with National Grid and the Division concerning the FY 2014 ISR Plan, there was significant discussion concerning the extended economic downturn, the actual expenditures seen in the FY 2013 ISR Plan, and the fact that the residential and commercial load increases and new customer connections are continuing to remain very low consistent with FY 2011 and FY 2012. Provide revised estimates associated with the statutory and regulatory categories, particularly the new consumer connects and load relief program consistent with what is being seen through FY 2013.

Response:

Please see response to Electric ISR Division 1-5.

Division 2-23 (Electric)
Statutory/Regulatory

Request:

Provide the current New Business forecasts that support revised levels for residential, commercial, transformer, and associated equipment blankets for FY 2014.

Response:

Please see response to Electric ISR Division 1-4.

Redacted

Division 2-24

Contact Voltage Program, Docket 4237

Request:

During the November 29, 2012 conference, National Grid committed to provide updated costs associated with this program, based on its completion of the RFP process by December 17, 2012. Provide these costs and the requested dollars to be incorporated in the FY 2014 ISR Plan for the Contact Voltage program, including the mobile contact voltage assessment process cost and the option of the mobile program being completed in one year versus the mobile program being spread out over four years.

Response:

The costs for the proposed Mobile Contact Voltage Program (which were not previously included in the FY 2014 ISR filing made on November 5, 2014) are as follows:

100% of mobile elevated voltage testing to be performed in Year 1 (FY 2014)
External Vendor Costs - $[redacted]

Support Costs
(internal administration, supervision, underground crew and police supervision) - $[redacted]
Total Costs $[redacted]

40% of mobile elevated voltage testing to be performed in Year 1 (FY 2014)
External Vendor Costs - $[redacted]

Support Costs
(internal administration, supervision, underground crew and police supervision) - $[redacted]
Total Costs $[redacted]

On December 18, 2012 in Docket 4237, the Company filed the received bids with the Commission and recommended that 100 percent of mobile elevated voltage testing be performed in Year 1 (FY 2014).

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Redacted

Division 2-25

Vegetation Management

Request:

During the November 29, 2014 conference, National Grid indicated it was in serious and concentrated negotiations with Verizon in regard to the joint ownership agreement and reimbursements in areas such as, and including, vegetation management. Provide National Grid's best estimate of the adjustments it believes will arise out of these negotiations in dollars it will receive from Verizon for the vegetation management program's categories, including, but not limited to, the ongoing vegetation management program, the EHTM program, and the vegetation management storm cost reimbursement.

Response:

As indicated at the November 29 conference, there are ongoing discussions that the National Grid outdoor lighting and attachments group is facilitating with Verizon related to the IOP and the Joint Ownership Agreement ("JOA").

As an initial matter, the Company cannot speak to Verizon's objectives in these discussions and cannot convey Verizon's positions due to the fact that the Company has signed a non-disclosure agreement that requires National Grid to obtain the consent of Verizon to disclose any information about Verizon, or the content or status of the discussions. The stated purpose of the non-disclosure agreement is to promote "open and off- the-record" discussion.

[redacted]

[redacted]

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Division 2-25, page 2

Vegetation Management

[redacted]

[redacted]

[redacted]

[redacted]

Division 2-26 (Electric)
Vegetation Management

Request:

Provide program details for the EHTM program since its 2008 inception up to the work proposed for FY 2014, including but not limited to (1) Number of circuits trimmed per year, (2) Cost for each circuit, (3) Mileage for each circuit.

Response:

Please refer to Attachment Electric ISR Division 2-26 which contains the requested information for FY2008 through FY2013. FY2014 circuits have not yet been determined as National Grid does not run the EHTM work planning models until all CY2012 interruption data is available. This ensures the most current data is used for targeting the following year's work.

FY 2008

Feeder	EHTM Cost	Scheduled 3 Phase Miles	Total OH Miles
49_53_13F2	$ 50,988	8.00	16.27
49_53_34F2	$ 146,946	22.00	77.28
49_53_51F1	$ 30,747	12.00	26.56
49_53_69F1	$ 30,531	7.00	19.35
49_56_33F4	$ 61,295	26.00	91.78
49_56_54F1	$ 144,649	29.00	116.44
49_56_63F6	$ 114,700	28.00	126.38
Totals	**$ 579,857**	**132.00**	**474.06**

FY 2009

Feeder	EHTM Cost	Scheduled 3 Phase Miles	Total OH Miles
49_53_102W51	$ 37,142	14.00	20.08
49_53_112W42	$ 19,657	7.00	23.53
49_53_2291	$ 9,909	5.00	5.59
49_53_23F1	$ 119,084	15.00	15.06
49_53_38F1	$ 116,579	19.00	76.16
49_53_5F4	$ 15,119	7.00	19.11
49_56_22F4	$ 78,906	6.18	19.94
49_56_30F1	$ 47,915	17.00	54.05
49_56_52F3	$ 52,877	10.00	25.77
Totals	**$ 497,187**	**100.18**	**259.29**

FY 2010

Feeder	EHTM Cost	Scheduled 3 Phase Miles	Total OH Miles
49_53_108W62	$ 53,967	11.00	18.01
49_53_20F2	$ 39,097	8.00	13.29
49_53_38F5	$ 4,537	9.00	40.36
49_53_5F2	$ 6,093	11.00	25.56
49_53_5F3	$ 6,430	8.00	20.31
49_53_7F1	$ 10,371	5.00	16.02
49_56_16F1	$ 21,373	16.00	33.09
49_56_17F2	$ 46,582	11.00	29.68
49_56_42F1	$ 22,319	10.25	31.22
49_56_43F1	$ 8,938	20.00	67.98
49_56_46F2	$ 216,051	12.00	36.75
49_56_59F4	$ 5,704	9.00	16.14
49_56_72F3	$ 45,221	9.00	15.15
Totals	**$ 486,681**	**139.25**	**363.56**

FY 2011

Feeder	EHTM Cost	Scheduled 3 Phase Miles	Total OH Miles
49_53_38F5	$ 69,255.87	9.00	40.36
Totals	**$ 69,255.87**	**9.00**	**40.36**

FY 2012

Feeder	EHTM Cost	Scheduled 3 Phase Miles	Total OH Miles
49_53_112W44	$ 124,828.44	9.85	51.13
49_53_34F3	$ 269,885.41	14.14	49.33
49_56_43F1	$ 91,683.35	20.03	67.98
49_56_59F4	$ 49,216.72	10.07	16.14
Totals	**$ 535,613.93**	**54.09**	**184.58**

FY 2013 (Including Post Irene EHTM work)

Feeder	EHTM Cost (YTD 11/30/12)	Scheduled 3 Phase Miles	Total OH Miles
49_53_106J1		1.33	2.36
49_53_107W61		4.09	5.68
49_53_107W83	$ 1,054.24	3.29	7.69
49_53_126W41	$ 97,531.41	10.23	34.48
49_53_12J2		1.33	1.71
49_53_15F1	$ 70,792.60	8.73	23.85
49_53_18F6	$ 4,303.65	8.77	28.14
49_53_18F8		3.96	12.99
49_53_27F1	$ 39,806.35	8.20	19.23
49_53_28J2		2.53	4.64
49_53_38F4	$ 2,157.16	6.77	15.27
49_53_4F1	$ 2,755.80	7.29	20.59
49_53_4F2	$ 4,207.92	12.21	28.95
49_53_50F2		2.77	6.94
49_53_69F3		7.23	14.28
49_53_71J3		7.23	2.07
49_53_76F7		9.90	17.39
49_53_77J2		1.50	3.4
49_53_77J3		1.50	2.44
49_56_14F1	$ 39,024.33	9.47	21.33
49_56_22F2	$ 1,821.87	6.66	16.96
49_56_57J2	$ 2,618.95	2.97	5.28
49_56_57J5	$ 2,036.97	2.91	6.13
49_56_59F2		8.76	18.57
49_56_68F3	$ 135,353.72	17.88	84.66
49_56_88F5	$ 54,676.92	15.91	45.01
Totals	**$ 458,141.89**	**173.42**	**450.04**

Division 2-27 (Electric)
Vegetation Management

Request:

Has National Grid assessed the outage performance of EHTM trimmed circuits versus those not addressed by the enhanced trimming program? Provide the statistical analysis of this comparison.

Response:

In the EHTM Benefit Analysis filed with the Division on September 5, 2012, on Page 5, Table 3 (below) compared the tree-related SAIFI improvements of the EHTM circuits for that year with the tree-related SAIFI trend for the entire population of circuits in the State.

Table 3 – EHTM Benefits Compared to Statewide Performance

	Average Annual CI Pre-Project	Average Annual CI - Post- Project	% Improvement
FY08 (3 years of data post project)			
EHTM	22,127	9,734	56%
All RI	103,442	87,826	15%
FY09 (3 years of data post-project)			
EHTM	32,092	10,511	67%
All RI	117,673	94,133	20%
FY10 (2 years of data post-project)			
EHTM	**50,145**	9,882	80%
All RI	99,345	98,133	1%
FY11 (1 year of data post-project)			
EHTM	1,132	186	84%
All RI	93,243	99,143	-6%

Division 2-28 (Electric)
Vegetation Management

Request:

Has National Grid had an independent party evaluate its planned VM cycle activities to determine what percentage of the Company's proposed trimming activities would benefit Verizon?

Response:

No, the Company has not had an independent party evaluate its planned VM cycle activities to determine what percentage of the Company's proposed trimming activities would benefit Verizon. Please refer to Electric ISR Division 2-25 regarding status of negotiations with Verizon.

Division 2-29 (Electric)
Flood Mitigation Program

Request:

During the November 29, 2014 conference, National Grid indicated that it is becoming increasingly difficult to identify the flood mitigation projects from the other substation capacity and feeder capacity projects as the Company moves through time. Since the Company is continuing to modify the flood mitigation project program and integrate those projects into the overall substation and feeder capacity programs, and the Company continues to delay the flood mitigation, it is becoming increasingly apparent that flood mitigation is a secondary issue to overall substation capacity. Therefore, it would be beneficial for the Company to provide its overall short and long term substation capacity program analysis, incorporating all of the substations including those that are understood to not require mitigation as a result of the floods from several years ago. As part of this request, please provide which substations involved in the flood the Company has now determined will be abandoned.

a. How much load will need to be transferred from flooded stations that have been abandoned or load that is now currently being fed from other stations that will require capacity at other stations in order to maintain a N-1 reliability capability?
b. Provide a table of all of the Company's substations, listing the base capacity, 100% forced rated capacity, existing load on each station, projected loads on each station in five year increments for the next twenty years, the proposed increased substation capacity at existing sites, and a list of proposed new substations and their capacity and what loads they will pick up from existing substations reflecting the reduction in load in existing stations as load is transferred.
c. Provide a list of additional feeders that will be constructed and/or upgraded in order to accommodate what is proposed by the Company in the overall substation expansion plan, including the incorporation of the entire flood mitigation process.

Response:

As a point of clarification, the flood mitigation work is not now considered a secondary issue, but one of many issues as applicable to all projects. Most projects have multiple issues and benefits with one main driver. For example a project categorized as 'Load Relief' does not only address the load relief issue. While load relief may be the primary driver and justification, this project may also address asset condition issues and provide a reliability benefit. The delay in flood mitigation work is not related to an apparent lower priority of risk but to a diligent analysis for an appropriate solution. In some cases, the flood risk can become a secondary driver to a capacity issue as the capacity solution provides a better overall benefit. In other cases, the flood risk remains the primary driver of the work.

Prepared by or under the supervision of: Jennifer L. Grimsley

Division 2-29 (Electric), page 2

Flood Mitigation Program

a. No additional reserve capacity will be required at other stations to maintain a N-1 reliability capability[1] due to load transferred from flooded stations that have been abandoned or load that is now currently being fed from other stations. There are capacity issues within a study area that may include a flooded station. When these capacity issues, which stand on their own merits, are planned out, they may create more economical solutions to address that flood issue that happens to be nearby. Transfers away from flooded stations are not creating capacity and/or reliability issues, they are taking advantage of nearby capacity work for better economics.

b. Please refer to Attachment Elec ISR-DIV 2-29(a). This list includes substation transformers with:
    i. Base capacity = SN Rating (MVA), the summer normal rating
    ii. 100% forced rated capacity = the Company is assuming this to be the emergency rating of the transformer or SE Rating (MVA)
    iii. Existing load = 2011 actual summer peak load
    iv. Project load in 5 year increments for next twenty years = each year is provided for fifteen years (the Company plans for fifteen years, not twenty); and
    v. The proposed new substations and their capacity and what loads they will pick up from existing substations = load transfers are shown in Attachment Elec ISR-DIV 2-29(a) and carried into Attachment Elec ISR-DIV 2-29(b).

c. Please see the Attachment Elec ISR-DIV 2-29(a). The 'Comments' column indicates new or upgraded feeders as well as feeders/substations which will be retired. The 'Spot Load' column for any year indicates load transfers. There is no formal or overall substation expansion plan. Substation expansion and feeder additions are analyzed on a case by case basis as detailed in these Attachments.

[1] National Grid's distribution reliability criteria is a modified N-1 criteria that allows for some unserved load for a short period.

Transformers - Normal Configuration Summary
2012 Annual Plan for Rhode Island

			System Voltage (kV)		Rating (MVA)			Projected Load																	
								2011						2012						2013					
Study Area	Substation	Tranf. ID.	From	To	SN	SE	Comments	Growth	Spot	MVA	% SN	% SE	N-1 Capacity	Growth	Spot	MVA	% SN	% SE	N-1 Capacity	Growth	Spot	MVA	% SN	% SE	N-1 Capacity
Blackstone Valley North	Farnum #105	T1	115	23	37.3	37.3		Base Year		3.8	10%	10%	33.5	3.7%		3.9	11%	11%	33.4	0.9%		4.0	11%	11%	33.3
Blackstone Valley North	Highland Dr	T1	115	13.8	53	62	Estimated in-service 2014	Base Year																	
Blackstone Valley North	Highland Dr	T2	115	13.8	53	62	Estimated in-service 2014	Base Year																	
Blackstone Valley North	Nasonville #127	T271	115	13.8	47.8	47.8		Base Year		34.1	71%	71%	13.7	3.7%		30.8	64%	64%	17.0	0.9%		31.0	65%	65%	16.8
Blackstone Valley North	Riverside #108	T81	115	13.8	41.83	45.23		Base Year		29.1	70%	64%	16.1	3.7%		29.6	71%	65%	15.6	0.9%		31.0	74%	68%	14.3
Blackstone Valley North	Riverside #108	T82	115	13.8	49.62	58.74		Base Year		43.7	88%	74%	15.1	3.7%		31.2	63%	53%	27.5	0.9%		33.6	68%	57%	25.2
Blackstone Valley North	Staples #112	T124	115	13.8	47.8	47.8		Base Year		38.0	80%	80%	9.8	3.7%		38.9	81%	81%	8.9	0.9%		39.3	82%	82%	8.5
Blackstone Valley North	West Farnum	T1	115	13.8	20	20	Retire 2012	Base Year		14.0	70%	70%	6.0												
Blackstone Valley North	Woonsocket	T1	115	13.8	47.8	50	In-Service 2012	Base Year			0%			3.7%		22.2	46%	44%	27.8	0.9%		25.4	53%	51%	24.6
Blackstone Valley South	Central Falls #104	North (J5 & J7)	13.8	4.16	3	3		Base Year		2.3	76%	76%	0.7	3.7%		2.4	79%	79%	0.6	0.9%		2.4	79%	79%	0.6
Blackstone Valley South	Central Falls #104	South (J1 & J3)	13.8	4.16	3.12	3.12		Base Year		1.4	44%	44%	1.7	3.7%		1.4	46%	46%	1.7	0.9%		1.4	46%	46%	1.7
Blackstone Valley South	Centre Street #106	(J1, J3, J7)	13.8	4.16	3.1	3.1		Base Year		2.3	74%	74%	0.8	3.7%		2.4	77%	77%	0.7	0.9%		2.4	78%	78%	0.7
Blackstone Valley South	Cottage St #109	(J1, J3, J5)	13.8	4.16	8.25	9.43		Base Year		6.0	73%	63%	3.4	3.7%		6.2	75%	66%	3.2	0.9%		6.3	76%	66%	3.2
Blackstone Valley South	Crossman St #111	(J1 & J3)	13.8	4.16	8.26	9.44		Base Year		3.0	37%	32%	6.4	3.7%		3.1	38%	33%	6.3	0.9%		3.2	38%	33%	6.3
Blackstone Valley South	Daggett Ave #113	(J1 & J2)	13.8	4.16	4.23	5.02		Base Year		2.0	48%	41%	3.0	3.7%		2.1	50%	42%	2.9	0.9%		2.1	50%	43%	2.9
Blackstone Valley South	Front #24	J1	13.8	4.16	3.1	3.1		Base Year		1.1	35%	35%	2.0	3.7%		1.1	36%	36%	2.0	0.9%		1.1	36%	36%	2.0
Blackstone Valley South	Hyde Avenue #28	(J1 & J2)	13.8	4.16	5.25	5.25		Base Year		1.9	36%	36%	3.3	3.7%		2.0	38%	38%	3.3	0.9%		2.0	38%	38%	3.3
Blackstone Valley South	Lee St. #30	(J1, J3, J5)	13.8	4.16	7	7		Base Year		4.6	66%	66%	2.4	3.7%		4.8	69%	69%	2.2	0.9%		4.9	69%	69%	2.1
Blackstone Valley South	Pawtucket No.1 #107	T71	115	13.8	48	48		Base Year		25.7	54%	54%	22.3	3.7%		26.7	56%	56%	21.3	0.9%		26.9	56%	56%	21.1
Blackstone Valley South	Pawtucket No.1 #107	T73A	115	13.8	48	48		Base Year		38.3	80%	80%	9.7	3.7%		39.7	83%	83%	8.3	0.9%		40.1	83%	83%	7.9
Blackstone Valley South	Pawtucket No.1 #107	T74	115	13.8	48	48		Base Year		28.1	59%	59%	19.9	3.7%		29.2	61%	61%	18.8	0.9%		29.4	61%	61%	18.6
Blackstone Valley South	Pawtucket No.2 #148	T1	13.8	4.16	7.6	9.36		Base Year		1.9	25%	21%	7.4	3.7%		2.0	26%	21%	7.4	0.9%		2.0	27%	22%	7.3
Blackstone Valley South	Pawtucket No.2 #148	T2	13.8	4.16	7.6	9.36		Base Year		3.0	39%	32%	6.4	3.7%		3.1	40%	33%	6.3	0.9%		3.1	41%	33%	6.3
Blackstone Valley South	Southeast #60		13.8	4.16	7	7		Base Year		2.2	32%	32%	4.8	3.7%		2.3	33%	33%	4.7	0.9%		2.3	33%	33%	4.7
Blackstone Valley South	Valley #102	T21	115	13.8	38.36	45.95		Base Year		21.9	57%	48%	24.0	3.7%		22.8	59%	50%	23.2	0.9%		23.0	60%	50%	23.0
Blackstone Valley South	Valley #102	T22	115	13.8	31.6	40.29		Base Year		18.7	59%	46%	21.6	3.7%		19.4	61%	48%	20.9	0.9%		19.6	62%	49%	20.7
Blackstone Valley South	Valley #102	T23	115	24	42.01	51.51		Base Year		3.9	9%	8%	47.6	3.7%		3.9	9%	8%	47.6	0.9%		3.9	9%	8%	47.6
Blackstone Valley South	Washington #126	T261	115	13.8	48	48		Base Year		22.4	47%	47%	25.6	3.7%		25.3	53%	53%	22.7	0.9%		25.5	53%	53%	22.5
Blackstone Valley South	Washington #126	T262	115	13.8	59.27	57.4		Base Year		25.4	43%	44%	32.0	3.7%		26.3	44%	46%	31.1	0.9%		26.5	45%	46%	30.9
Central RI East	APPONAUG 3	3	23	12.47	15.5	19.6		Base Year		7.5	48%	38%	12.1	6.7%		8.0	52%	41%	11.6	4.1%		8.3	54%	43%	11.3
Central RI East	APPONAUG 3	4	23	12.47	11.9	12.6		Base Year		7.8	66%	62%	4.8	6.7%		8.4	70%	66%	4.2	4.1%		8.7	73%	69%	3.9
Central RI East	AUBURN 73	1	23	4.16	10.6	11.8		Base Year		4.6	44%	39%	7.2	6.7%		4.9	47%	42%	6.9	4.1%		5.1	49%	44%	6.7
Central RI East	AUBURN 73	2	23	4.16	9.7	10.6		Base Year		3.1	32%	29%	7.5	6.7%		3.3	34%	31%	7.3	4.1%		3.4	36%	32%	7.2
Central RI East	DRUMROCK 14	3	115	23/12.47	53.0	76.0		Base Year		29.0	55%	38%	47.0	6.7%		31.0	58%	41%	45.1	4.1%		32.2	61%	42%	43.8
Central RI East	DRUMROCK 14	4	115	23	89.0	107.4		Base Year		39.2	44%	37%	68.2	6.7%		41.8	47%	39%	65.6	4.1%		43.6	49%	41%	63.8
Central RI East	DRUMROCK 14	5	115	23/12.47	107.0	107.0		Base Year		54.7	51%	51%	52.3	6.7%		58.3	55%	55%	48.7	4.1%		60.7	57%	57%	46.3
Central RI East	KILVERT STREET 86	1	115	12.47	67.0	84.0	Expected In-Service 2015	Base Year																	
Central RI East	KILVERT STREET 87	2	115	12.47	67.0	84.0		Base Year		27.1	41%	32%	56.9	6.7%		29.0	43%	34%	55.0	4.1%		30.1	45%	36%	53.9
Central RI East	LAKEWOOD 57	1	23	4.16	10.1	10.6		Base Year		5.8	58%	55%	4.8	6.7%		6.2	62%	58%	4.4	4.1%		6.5	64%	61%	4.2
Central RI East	LAKEWOOD 57	2	23	4.16	10.2	11.5		Base Year		3.1	31%	27%	8.3	6.7%		3.4	33%	29%	8.1	4.1%		3.5	34%	30%	8.0
Central RI East	LINCOLN AVENUE 72	1	115	12.47	52.1	54.9		Base Year		23.8	46%	43%	31.1	6.7%		25.4	49%	46%	29.5	4.1%		26.4	51%	48%	28.5
Central RI East	LINCOLN AVENUE 72	2	115	12.47	52.1	54.9		Base Year		24.2	46%	44%	30.7	6.7%		25.8	50%	47%	29.1	4.1%		26.9	52%	49%	28.0
Central RI East	PAWTUXET 31	1	23	4.16	4.3	5.1	Planned retire 2015	Base Year		3.4	80%	67%	1.7	6.7%		3.7	85%	72%	1.4	4.1%		3.8	88%	75%	1.3
Central RI East	PONTIAC 27	1	115	12.47	50.7	53.3		Base Year		19.8	39%	37%	33.5	6.7%		21.1	42%	40%	32.2	4.1%		22.0	43%	41%	31.3
Central RI East	PONTIAC 27	2	115	12.47	46.5	51.9		Base Year		24.6	53%	48%	27.2	6.7%		26.3	57%	51%	25.6	4.1%		27.4	59%	53%	24.5
Central RI East	SOCKANOSSET 24	1	115	23	50.3	56.8		Base Year		26.2	52%	46%	30.6	6.7%		28.0	56%	49%	28.9	4.1%		29.1	58%	51%	27.7
Central RI East	SOCKANOSSET 24	2	115	23	50.4	57.0		Base Year		23.9	47%	42%	33.1	6.7%		25.5	51%	45%	31.5	4.1%		26.5	53%	47%	30.5
Central RI East	WARWICK 52	1	23	12.47	11.6	12.7		Base Year		11.0	94%	86%	1.7	0.0%		9.8	85%	78%	2.9	8.0%		10.6	92%	84%	2.1
Central RI East	WARWICK 52	4	23	12.47	12.0	12.0		Base Year		8.5	71%	71%	3.5	0.0%		7.8	65%	65%	4.2	8.0%		8.4	70%	70%	3.6
Central RI West	ANTHONY	1	23	12.47	7.8	8.1		Base Year		8.5	109%	105%	-0.4	0.0%		8.4	107%	104%	-0.3	8.0%		7.1	91%	88%	1.0
Central RI West	ANTHONY	2	23	12.47	7.8	8.1		Base Year		6.8	87%	84%	1.3	0.0%		6.7	86%	83%	1.4	8.0%		7.3	93%	90%	0.8
Central RI West	ARCTIC	1	23	4.16	5.0	5.0		Base Year		3.1	63%	62%	1.9	0.0%		3.1	62%	62%	1.9	8.0%		3.3	67%	66%	1.7
Central RI West	ARCTIC	2	23	4.16	6.7	7.4		Base Year		3.1	46%	42%	4.3	0.0%		2.9	44%	39%	4.5	8.0%		3.2	47%	43%	4.2
Central RI West	COVENTRY	1	23	12.47	11.4	13.5		Base Year		7.9	70%	59%	5.6	0.0%		10.1	89%	75%	3.4	8.0%		9.4	83%	70%	4.1
Central RI West	COVENTRY MITS	1	34.5	12.47	13.0	14.0	In-Service 2013	Base Year												8.0%		9.2	71%	66%	4.8
Central RI West	DIVISION ST	1	34.5	12.47	23.7	27.6		Base Year		13.3	56%	48%	14.3	0.0%		12.8	54%	46%	14.8	8.0%		13.8	58%	50%	13.8
Central RI West	DIVISION ST	2	34.5	12.47	23.7	27.6		Base Year		15.2	64%	55%	12.4	0.0%		9.4	40%	34%	18.2	8.0%		10.1	43%	37%	17.5
Central RI West	HOPE	1	23	12.47	7.5	8.5		Base Year		7.2	96%	85%	1.3	0.0%		6.6	87%	78%	1.9	8.0%		6.1	81%	72%	2.4
Central RI West	HOPE	2*	23	12.47	13.7	16.5		Base Year		9.9	72%	60%	6.6	0.0%		9.1	67%	55%	7.4	8.0%		9.8	72%	59%	6.7
Central RI West	HOPKINS HILL	1*	34.5	12.47	48.8	51.0		Base Year		25.5	52%	50%	25.5	0.0%		25.0	51%	49%	26.0	8.0%		22.3	46%	44%	28.7
Central RI West	HOPKINS HILL	2*	34.5	12.47	49.2	52.0		Base Year		26.5	54%	51%	25.5	0.0%		26.6	54%	51%	25.4	8.0%		29.8	60%	57%	22.2
Central RI West	HUNT RIVER	2	34.5	12.47	11.2	12.7	Planned retire 2017 - Flood Mitigation	Base Year		4.4	39%	35%	8.3	0.0%		4.4	39%	35%	8.3	8.0%		4.8	42%	38%	7.9
Central RI West	KENT COUNTY	5	115	12.47	50.0	58.0	Expected In-Service 2017	Base Year																	
Central RI West	KENT COUNTY	6	115	12.47	50.7	58.9		Base Year		38.9	77%	66%	20.0	0.0%		37.5	74%	64%	21.4	8.0%		40.5	80%	69%	18.4
Central RI West	KENT COUNTY	1*	115	34.5	57.3	67.6		Base Year		0.0	0%	0%	67.6	0.0%		30.7	54%	45%	36.9	8.0%		33.2	58%	49%	34.4
Central RI West	KENT COUNTY	2*	115	34.5	66.3	69.9		Base Year		42.0	63%	60%	27.9	0.0%		32.0	48%	46%	37.9	8.0%		34.6	52%	49%	35.3
Central RI West	KENT COUNTY	7*	115	34.5	57.3	68.8		Base Year		39.7	69%	58%	29.1	0.0%		30.0	52%	44%	38.8	8.0%		32.4	57%	47%	36.4
Central RI West	NATICK	1	23	12.47	13.2	14.3		Base Year		8.4	64%	59%	5.9	0.0%		8.6	65%	60%	5.7	8.0%		9.3	70%	65%	5.0
Central RI West	NATICK	2	23	12.47	13.5	14.5		Base Year		7.0	52%	48%	7.5	0.0%		6.0	44%	41%	8.5	8.0%		6.4	48%	44%	8.1
Central RI West	WARWICK MALL	1	23	12.47	8.8	8.9		Base Year		3.5	39%	39%	5.4	0.0%		3.9	44%	44%	5.0	8.0%		4.2	48%	47%	4.7
Central RI West	WARWICK MALL	2	23	12.47	8.7	9.1		Base Year		2.6	30%	29%	6.5	0.0%		2.6	30%	29%	6.5	8.0%		2.8	32%	31%	6.3

Transformers - Normal Configuration Summary
2012 Annual Plan for Rhode Island

			System Voltage (kV)		Rating (MVA)			Projected Load																	
								2011						2012						2013					
Study Area	Substation	Tranf. ID.	From	To	SN	SE	Comments	Growth	Spot	MVA	% SN	% SE	N-1 Capacity	Growth	Spot	MVA	% SN	% SE	N-1 Capacity	Growth	Spot	MVA	% SN	% SE	N-1 Capacity
Central RI West	NEW LONDON AVE	1	115	12.47	55.0	60.0	Expected In-Service 2015	Base Year																	
East Bay	BARRINGTON 4	1	23	12.47	35.19	35.09		Base Year		18.4	52%	53%	16.6	3.8%		20.0	57%	57%	15.1	1.0%		20.2	57%	57%	14.9
East Bay	BRISTOL 51	1	115	12.47	56.9	63.4		Base Year		18.3	32%	29%	45.1	3.8%		19.0	33%	30%	44.4	1.0%		19.2	34%	30%	44.2
East Bay	BRISTOL 51	2	23	12.47	25.1	29.8		Base Year		9.3	37%	31%	20.5	3.8%		9.6	38%	32%	20.2	1.0%		9.7	39%	33%	20.1
East Bay	KENT CORNERS 47	T1	23	4.16	7.14	7.53		Base Year		2.6	37%	35%	4.9	3.8%		2.7	38%	36%	4.8	1.0%		2.8	39%	37%	4.8
East Bay	KENT CORNERS 47	T2	23	4.16	6.82	8.07		Base Year		4.3	63%	53%	3.8	3.8%		4.5	65%	55%	3.6	1.0%		4.5	66%	56%	3.6
East Bay	PHILLIPSDALE 20	T1	115	23	56	56		Base Year		10.3	18%	18%	45.7	3.8%		10.6	19%	19%	45.4	1.0%		10.8	19%	19%	45.2
East Bay	PHILLIPSDALE 20	T2	115	23	45.32	56.75		Base Year		7.7	17%	14%	49.1	3.8%		8.0	18%	14%	48.8	1.0%		8.1	18%	14%	48.7
East Bay	PHILLIPSDALE 20	T3	23	12.47	25.16	28.87		Base Year		12.3	49%	43%	16.6	3.8%		12.7	51%	44%	16.1	1.0%		12.9	51%	45%	16.0
East Bay	WAMPANOAG 48	T1	115	12.47	42.83	52.72		Base Year		27.9	65%	53%	24.8	3.8%		28.2	66%	53%	24.5	1.0%		28.5	66%	54%	24.3
East Bay	WAMPANOAG 48	T2	115	12.47	52.36	55.33		Base Year		29.3	56%	53%	26.0	3.8%		27.3	52%	49%	28.1	1.0%		27.5	53%	50%	27.8
East Bay	WARREN 5	5	115	23	60.96	65.05		Base Year		7.8	13%	12%	57.2	3.8%		8.1	13%	12%	56.9	1.0%		8.2	13%	13%	56.9
East Bay	WARREN 5	6	115	23	59.6	64.17		Base Year		20.3	34%	32%	43.9	3.8%		21.0	35%	33%	43.1	1.0%		21.2	36%	33%	42.9
East Bay	WARREN 5	T1	115	12.47	48.28	53.43		Base Year		15.7	32%	29%	37.8	3.8%		16.3	34%	30%	37.2	1.0%		14.3	30%	27%	39.2
East Bay	WARREN 5	T2	115	12.47	50.62	59.57		Base Year		17.1	34%	29%	42.5	3.8%		17.7	35%	30%	41.8	1.0%		17.9	35%	30%	41.7
East Bay	WATERMAN AVENUE 78	T1	23	12.47	16.36	18.26		Base Year		4.8	29%	26%	13.5	3.8%		7.3	45%	40%	11.0	1.0%		7.4	45%	40%	10.9
East Bay	WATERMAN AVENUE 78	T2	23	12.47	16.36	18.26		Base Year		5.0	30%	27%	13.3	3.8%		6.1	37%	33%	12.2	1.0%		6.2	38%	34%	12.1
Newport	Bailey Brook	191	23	4.16	8.3	8.7	Planned retire 2015 (Newport related)	Base Year		1.6	19%	18%	7.1	6.2%		1.7	20%	20%	7.0	3.6%		1.7	21%	20%	7.0
Newport	Bailey Brook	192	23	4.16	8.6	10.4	Planned retire 2015 (Newport related)	Base Year		2.1	25%	20%	8.3	6.2%		1.4	16%	13%	9.0	3.6%		1.4	16%	13%	9.0
Newport	Clarke St	651	23	4.16	4.1	4.3	Planned Upgrade 2015	Base Year		3.2	78%	74%	1.1	6.2%		3.4	83%	79%	0.9	3.6%		3.6	88%	84%	0.7
Newport	Clarke St	652	23	4.16	4.5	5.0		Base Year		1.9	95%	90%	0.2	6.2%		2.1	105%	100%	0.0	3.6%		2.1	105%	100%	0.0
Newport	Dexter	361	115	69	121.0	130.0		Base Year		65.0	54%	50%	65.0	6.2%		69.0	57%	53%	61.0	3.6%		71.5	59%	55%	58.5
Newport	Dexter	362	115	69	61.0	65.0		Base Year		28.0	46%	43%	37.0	6.2%		29.7	49%	46%	35.3	3.6%		30.8	51%	47%	34.2
Newport	Dexter	363	115	69	61.0	65.0		Base Year		28.0	46%	43%	37.0	6.2%		29.7	49%	46%	35.3	3.6%		30.8	51%	47%	34.2
Newport	Dexter	364	115	13.8	44.6	47.4		Base Year		23.8	53%	50%	23.6	6.2%		25.2	57%	53%	22.2	3.6%		26.1	59%	55%	21.3
Newport	Eldred	451	23	4.16	7.9	9.6	Planned retire 2015	Base Year		5.2	65%	54%	4.4	6.2%		5.5	69%	57%	4.1	3.6%		5.7	72%	59%	3.9
Newport	Eldred NEW	1	23	4.16	5.8	7.0	Expected in-service 2015	Base Year																	
Newport	Eldred NEW	2	23	4.16	5.8	7.0	Expected in-service 2015	Base Year																	
Newport	Gate 2	381	69	23	54.2	63.7		Base Year		21.0	39%	33%	42.7	6.2%		22.9	42%	36%	40.8	3.6%		23.8	44%	37%	39.9
Newport	Gate 2	382	69	23	55.0	60.0	Expected in-service 2015	Base Year																	
Newport	Gate 2	731	23	4.16	8.1	8.7	Planned retire 2015 (Newport related)	Base Year		4.5	56%	52%	4.2	6.2%		4.8	59%	55%	3.9	3.6%		5.0	61%	57%	3.7
Newport	Harrison	321	23	4.16	8.3	9.7		Base Year		2.4	29%	25%	7.3	6.2%		2.5	30%	26%	7.2	3.6%		2.6	32%	27%	7.1
Newport	Harrison	322	23	4.16	8.1	10.1		Base Year		4.4	54%	44%	5.7	6.2%		4.7	58%	47%	5.4	3.6%		4.8	60%	48%	5.3
Newport	Hospital	461	23	4.16	4.1	4.3		Base Year		2.2	55%	51%	2.1	6.2%		2.4	58%	56%	1.9	3.6%		2.5	60%	58%	1.8
Newport	Hospital	462	23	4.16	4.1	4.3		Base Year		1.8	44%	42%	2.5	6.2%		1.9	47%	44%	2.4	3.6%		2.0	49%	47%	2.3
Newport	Jepson	341	23	4.16	9.7	10.4	Planned retire 2015 (Newport related)	Base Year		2.3	24%	22%	8.1	6.2%		2.5	26%	24%	7.9	3.6%		2.6	27%	25%	7.8
Newport	Jepson	371	69	23	16.5	18.5		Base Year		5.7	35%	31%	12.8	6.2%		6.1	37%	33%	12.4	3.6%		6.3	38%	34%	12.2
Newport	Jepson	372	69	23	23.2	24.8		Base Year		10.3	44%	42%	14.5	6.2%		10.9	47%	44%	13.9	3.6%		11.3	49%	46%	13.5
Newport	Jepson	373	69	23	48.9	57.9		Base Year		29.8	61%	51%	28.1	6.2%		31.6	65%	55%	26.3	3.6%		32.8	67%	57%	25.1
Newport	Jepson	374	69	13.8	42.9	48.6		Base Year		28.2	66%	58%	20.4	6.2%		29.9	70%	62%	18.7	3.6%		31.0	72%	64%	17.6
Newport	Jepson	376	69	23	15.4	16.4		Base Year		6.3	41%	38%	10.1	6.2%		6.7	43%	41%	9.7	3.6%		6.9	45%	42%	9.5
Newport	Kingston	311	23	4.16	7.9	9.6		Base Year		5.6	70%	58%	4.0	6.2%		5.9	75%	61%	3.7	3.6%		6.1	77%	64%	3.5
Newport	Kingston	312	23	4.16	7.9	9.6		Base Year		3.7	47%	39%	5.9	6.2%		3.9	49%	41%	5.7	3.6%		4.0	51%	42%	5.6
Newport	Merton	511	23	4.16	2.2	2.4		Base Year		1.3	58%	54%	1.1	6.2%		1.7	77%	71%	0.7	3.6%		1.8	80%	75%	0.6
Newport	Merton	512	23	4.16	8.4	10.0		Base Year		3.9	46%	39%	6.1	6.2%		4.5	53%	45%	5.5	3.6%		4.6	55%	46%	5.4
Newport	Newport Sub	1	69	13.8	55.0	60.0	Expected in-service 2015	Base Year																	
Newport	Newport Sub	2	69	13.8	55.0	60.0	Expected in-service 2015	Base Year																	
Newport	No. Aquidneck	211	23	4.16	8.0	10.2		Base Year		4.3	54%	42%	5.9	6.2%		5.2	66%	51%	5.0	3.6%		5.4	68%	53%	4.8
Newport	So. Aquidneck	221	23	4.16	7.9	9.6		Base Year		7.1	90%	74%	2.5	6.2%		6.9	87%	72%	2.7	3.6%		7.1	90%	74%	2.5
Newport	Vernon Ave	231	23	4.16	3.6	3.9	Planned retire 2015 (Newport related)	Base Year		3.3	90%	85%	0.6	6.2%		3.6	100%	92%	0.3	3.6%		3.8	104%	97%	0.1
Newport	Vernon Ave	232	23	4.16	3.6	3.9	Planned retire 2015 (Newport related)	Base Year		1.2	33%	31%	2.7	6.2%		1.7	45%	44%	2.2	3.6%		1.7	47%	44%	2.2
Newport	West Howard	541	23	4.16	12.6	14.8		Base Year		7.6	61%	51%	7.2	6.2%		7.7	61%	52%	7.1	3.6%		8.0	64%	54%	6.8
Newport	West Howard	542	23	4.16	13.1	13.58		Base Year		4.8	37%	35%	8.8	6.2%		5.1	39%	38%	8.5	3.6%		5.3	40%	39%	8.3
North Central RI	Centerdale #50	T1	23	4.16	7.1	7.54		Base Year		2.9	41%	38%	4.7	3.7%		3.0	42%	40%	4.6	3.9%		3.1	44%	41%	4.4
North Central RI	Centerdale #50	T3	23	12.47	7.93	8.34		Base Year		4.7	60%	57%	3.6	3.7%		4.9	62%	59%	3.4	3.9%		5.1	64%	61%	3.2
North Central RI	Chopmist #34	T1	23	12.47	15.96	16.42		Base Year		9.5	60%	58%	6.9	3.7%		9.9	62%	60%	6.6	3.9%		10.2	64%	62%	6.2
North Central RI	Chopmist #34	T2	23	12.47	13.84	13.57		Base Year		6.6	48%	49%	7.0	3.7%		6.9	49%	50%	6.7	3.9%		7.1	51%	52%	6.5
North Central RI	Chopmist #34	T3	23	12.47	12.81	13.94		Base Year		5.9	46%	42%	8.1	3.7%		6.1	47%	44%	7.9	3.9%		6.3	49%	45%	7.6
North Central RI	Farnum Pike #23	T1	115	12.47	64.8	64.8		Base Year		19.8	31%	31%	45.0	3.7%		20.6	32%	32%	44.2	3.9%		21.4	33%	33%	43.4
North Central RI	Farnum Pike #23	T2	115	12.47	64.8	64.8		Base Year		24.6	38%	38%	40.2	3.7%		25.5	39%	39%	39.3	3.9%		26.5	41%	41%	38.3
North Central RI	Johnston #18	T1	115	12.47	25	35		Base Year		19.2	77%	55%	15.8	3.7%		19.7	79%	56%	15.3	3.9%		14.4	58%	41%	20.6
North Central RI	Johnston #18	T1 - 23	115	23	63.4	77		Base Year		20.2	32%	26%	56.8	3.7%		20.9	33%	27%	56.1	3.9%		21.8	34%	28%	55.2
North Central RI	Johnston #18	T3	115	12.47	53.68	56.33		Base Year		27.7	52%	49%	28.6	3.7%		28.7	54%	51%	27.6	3.9%		23.8	44%	42%	32.5
North Central RI	Johnston #18	T4	115	12.47	68.6	74		Base Year		15.1	22%	20%	58.9	3.7%		15.7	23%	21%	58.3	3.9%		26.1	38%	35%	47.9
North Central RI	Johnston #18	T2- 23	115	23	80	90		Base Year		33.0	41%	37%	57.0	3.7%		34.2	43%	38%	55.8	3.9%		35.6	44%	40%	54.4
North Central RI	Manton #69	T2	23	12.47	25.46	26.66		Base Year		19.3	76%	73%	7.3	3.7%		20.0	79%	75%	6.6	3.9%		20.8	82%	78%	5.8
North Central RI	Putnam Pike #38	T1	115	12.47	64.94	68.79		Base Year		28.1	43%	41%	40.7	3.7%		29.1	45%	42%	39.7	3.9%		27.8	43%	40%	41.0
North Central RI	Putnam Pike #38	T2	115	12.47	64.94	68.79		Base Year		16.4	25%	24%	52.4	3.7%		17.0	26%	25%	51.8	3.9%		20.1	31%	29%	48.7
North Central RI	Shun Pike #35	T1	115	12.47	68.6	74	Expected in-service 2018	Base Year																	
North Central RI	Shun Pike SIMS	T3	115	13.2	27	30	Expected in-service 2014	Base Year																	
North Central RI	West Cranston #21	T1	115	12.47	27.78	29.91		Base Year		10.5	38%	35%	19.4	3.7%		10.9	39%	37%	19.0	3.9%		10.5	38%	35%	19.4
North Central RI	West Cranston #21	T2	115	12.47	27.76	29.86		Base Year		18.0	65%	60%	11.9	3.7%		18.6	67%	62%	11.2	3.9%		20.1	72%	67%	9.8
North Central RI	West Greenville # 45	T3	23	12.47	11.91	13.56		Base Year		2.5	21%	19%	11.0	3.7%		2.6	22%	19%	10.9	3.9%		2.7	23%	20%	10.8
North Central RI	Wolf Hill #19	T1	115	23	65.01	69.83		Base Year		26.2	40%	38%	43.6	3.7%		27.2	42%	39%	42.7	3.9%		28.2	43%	40%	41.6
Providence	Admiral Street #9	T1	23	11/4.16	15	15		Base Year		5.7	38%	38%	9.3	3.8%		2.6	18%	18%	12.4	3.8%		2.7	18%	18%	12.3
Providence	Admiral Street #9	T2	23	11/4.16	15	15		Base Year		0.0	0%	0%	15.0	3.8%		3.4	23%	23%	11.6	3.8%		3.5	23%	23%	11.5
Providence	Admiral Street #9	T3	115	23	62.1	63.7		Base Year		21.0	34%	33%	42.7	3.8%		21.8	35%	34%	41.9	3.8%		22.6	36%	36%	41.1

Transformers - Normal Configuration Summary
2012 Annual Plan for Rhode Island

			System Voltage (kV)		Rating (MVA)			Projected Load																	
								2011						2012						2013					
Study Area	Substation	Tranf. ID.	From	To	SN	SE	Comments	Growth	Spot	MVA	% SN	% SE	N-1 Capacity	Growth	Spot	MVA	% SN	% SE	N-1 Capacity	Growth	Spot	MVA	% SN	% SE	N-1 Capacity
Providence	Admiral Street #9	T4	115	23	63	64.9		Base Year		20.5	33%	32%	44.4	3.8%		21.3	34%	33%	43.6	3.8%		22.1	35%	34%	42.8
Providence	Admiral Street #9	T5	23	4.16	15.13	15.36		Base Year		6.1	40%	40%	9.3	3.8%		5.8	38%	38%	9.5	3.8%		5.9	39%	38%	9.5
Providence	Clarkson Street #13	T1	115	12.47	65.46	81.01		Base Year		33.4	51%	41%	47.6	3.8%		34.7	53%	43%	46.3	3.8%		34.8	53%	43%	46.2
Providence	Clarkson Street #13	T2	115	12.47	65.16	80.24		Base Year		28.4	44%	35%	51.9	3.8%		29.4	45%	37%	50.8	3.8%		31.7	49%	40%	48.5
Providence	Dyer St #2	T1	11.5	4.16	18.27	19.78		Base Year		7.5	41%	38%	12.3	3.8%		7.8	43%	40%	12.0	3.8%		7.9	43%	40%	11.9
Providence	Dyer St #2	T2	11.5	4.16	18.25	19.74		Base Year		5.0	27%	25%	14.7	3.8%		5.2	28%	26%	14.6	3.8%		5.2	29%	27%	14.5
Providence	East George St. #77	T1	23	4.16	12.59	15.27		Base Year		4.1	33%	27%	11.2	3.8%		4.3	34%	28%	11.0	3.8%		4.3	34%	28%	11.0
Providence	East George St. #77	T2	23	4.16	12.59	15.27		Base Year		4.8	38%	31%	10.5	3.8%		4.6	37%	30%	10.6	3.8%		4.7	37%	31%	10.6
Providence	Elmwood #7 (12.47 kV)	T2	23	12.47	40.58	45.78		Base Year		27.6	68%	60%	18.2	3.8%		29.2	72%	64%	16.6	3.8%		29.5	73%	64%	16.3
Providence	Franklin Square #11	2207	11.5	23	16.06	18.75		Base Year		6.5	40%	35%	12.3	3.8%		6.7	42%	36%	12.0	3.8%		7.0	44%	37%	11.7
Providence	Franklin Square #11	2210	11.5	23	17.14	15.85		Base Year		9.7	57%	61%	6.2	3.8%		10.1	59%	64%	5.8	3.8%		10.5	61%	66%	5.4
Providence	Franklin Square #11	2220	11.5	23	17.7	19.3		Base Year		14.0	79%	73%	5.3	3.8%		14.5	82%	75%	4.8	3.8%		15.1	85%	78%	4.2
Providence	Franklin Square #11	2260	11.5	23	16.06	18.75		Base Year		4.7	29%	25%	14.1	3.8%		4.9	30%	26%	13.9	3.8%		5.1	32%	27%	13.7
Providence	Franklin Square #11	3320	11.5	34.5	25.87	29.66		Base Year		7.0	27%	24%	22.7	3.8%		7.3	28%	24%	22.4	3.8%		7.5	29%	25%	22.1
Providence	Franklin Square #11	3324	11.5	34.5	25.75	29.5		Base Year		9.0	35%	31%	20.5	3.8%		9.3	36%	32%	20.2	3.8%		9.7	38%	33%	19.8
Providence	Franklin Square #11	T1	115	11.5	50.65	61.04		Base Year		21.0	41%	34%	40.0	3.8%		21.8	43%	36%	39.2	3.8%		22.6	45%	37%	38.4
Providence	Franklin Square #11	T2	115	11.5	51.24	56.69		Base Year		15.0	29%	26%	41.7	3.8%		15.6	30%	27%	41.1	3.8%		16.2	32%	29%	40.5
Providence	Franklin Square #11	T3	115	11.5	51.24	56.69		Base Year		26.0	51%	46%	30.7	3.8%		27.0	53%	48%	29.7	3.8%		28.0	55%	49%	28.7
Providence	Geneva #71	T1	23	4.16	11.54	14.19		Base Year		7.8	68%	55%	6.3	3.8%		8.1	71%	57%	6.0	3.8%		8.2	71%	58%	6.0
Providence	Harris Avenue #12	T1	23	4.16	11.48	12.72		Base Year		4.4	38%	34%	8.4	3.8%		4.5	39%	36%	8.2	3.8%		4.6	40%	36%	8.2
Providence	Harris Avenue #12	T2	23	4.16	9.06	11.52		Base Year		2.3	25%	20%	9.2	3.8%		2.4	26%	21%	9.2	3.8%		2.4	26%	21%	9.1
Providence	Huntington Park #67	T1	23	4.16	3	3		Base Year		1.8	61%	61%	1.2	3.8%		1.9	64%	64%	1.1	3.8%		1.9	64%	64%	1.1
Providence	Knightsville #66	T1	22.9	4.16	10.48	11.02		Base Year		6.2	59%	56%	4.9	3.8%		6.4	61%	58%	4.6	3.8%		6.5	62%	59%	4.6
Providence	Knightsville #66	T2	22.9	4.16	10.48	11.02		Base Year		4.2	40%	38%	6.8	3.8%		4.4	42%	40%	6.6	3.8%		4.4	42%	40%	6.6
Providence	Lippitt Hill #79	T1	22.9	12.47	25.11	27.54		Base Year		7.1	28%	26%	20.4	3.8%		7.4	29%	27%	20.1	3.8%		7.5	30%	27%	20.1
Providence	Lippitt Hill #79	T2	22.9	12.47	25.11	27.54		Base Year		7.9	31%	29%	19.7	3.8%		8.6	34%	31%	19.0	3.8%		8.7	35%	31%	18.9
Providence	Olneyville #6	T1	11.5	4.16	11.8	13.02		Base Year		4.5	38%	35%	8.5	3.8%		4.7	40%	36%	8.3	3.8%		4.7	40%	36%	8.3
Providence	Olneyville #6	T3	11.5	4.16	11.8	13.02		Base Year		3.0	26%	23%	10.0	3.8%		3.2	27%	24%	9.9	3.8%		3.2	27%	24%	9.8
Providence	Point Street #76	T1	115	12.47	77	89.8		Base Year		34.0	44%	38%	55.8	3.8%		33.4	43%	37%	56.4	3.8%		33.7	44%	38%	56.1
Providence	Point Street #76	T2	115	12.47	70.86	79.98		Base Year		32.2	45%	40%	47.8	3.8%		34.7	49%	43%	45.3	3.8%		35.1	49%	44%	44.9
Providence	Rochambeau Ave #37	T1	22.9	4.16	11.96	13.12		Base Year		4.7	40%	36%	8.4	3.8%		4.9	41%	38%	8.2	3.8%		5.0	42%	38%	8.1
Providence	Rochambeau Ave #37	T2	11.45	4.16	11.02	13.04		Base Year		3.1	28%	24%	9.9	3.8%		3.6	33%	28%	9.4	3.8%		3.6	33%	28%	9.4
Providence	South Street #1	24	11.5	23	9.1	10.23		Base Year		5.5	60%	54%	4.7	3.8%		5.7	63%	56%	4.5	3.8%		5.9	65%	58%	4.3
Providence	South Street #1	2201	11.5	23	9.1	10.23		Base Year		3.1	34%	30%	7.1	3.8%		3.2	35%	31%	7.0	3.8%		3.3	37%	33%	6.9
Providence	South Street #1	2216	11.5	23	10	10		Base Year		3.8	38%	38%	6.2	3.8%		3.9	39%	39%	6.1	3.8%		4.1	41%	41%	5.9
Providence	South Street #1	2248	11.5	23	12.81	14.33		Base Year		7.4	58%	52%	6.9	3.8%		7.7	60%	54%	6.6	3.8%		8.0	62%	56%	6.4
Providence	South Street #1	T1	115	11.5	66.34	78.75		Base Year		29.0	44%	37%	49.8	3.8%		30.1	45%	38%	48.6	3.8%		31.2	47%	40%	47.5
Providence	South Street #1	T2	115	11.5	66.78	77.14		Base Year		23.0	34%	30%	54.1	3.8%		23.9	36%	31%	53.3	3.8%		24.8	37%	32%	52.4
Providence	South Street #1	T3	115	11.5	72.69	91.22		Base Year		29.0	40%	32%	62.2	3.8%		30.1	41%	33%	61.1	3.8%		31.2	43%	34%	60.0
Providence	Sprague St. #36	T1	23	4.16	10.58	11.85		Base Year		2.6	24%	22%	9.3	3.8%		2.7	25%	23%	9.2	3.8%		2.7	25%	23%	9.2
Providence	Sprague St. #36	T2	23	4.16	10.79	12		Base Year		3.0	28%	25%	9.0	3.8%		3.1	29%	26%	8.9	3.8%		3.1	29%	26%	8.9
South County East	BONNET 42	2	34.5	12.47	11.3	12.2		Base Year		9.2	82%	75%	3.0	6.7%		9.9	87%	81%	2.3	4.1%		10.3	91%	84%	1.9
South County East	DAVISVILLE 84	1	115	34.5	45.3	52.1		Base Year		17.3	38%	33%	34.8	6.7%		18.5	41%	36%	33.6	4.1%		19.2	42%	37%	32.9
South County East	DAVISVILLE 84	2A	115	34.5	45.1	51.8		Base Year		21.0	47%	41%	30.8	6.7%		22.4	50%	43%	29.4	4.1%		23.3	52%	45%	28.5
South County East	LAFAYETTE 30	1	34.5	12.47	7.6	8.6		Base Year		6.2	81%	72%	2.4	6.7%		6.6	87%	77%	2.0	4.1%		6.8	90%	79%	1.8
South County East	LAFAYETTE 30	2	34.5	12.47	12.3	13.2		Base Year		7.4	60%	56%	5.8	6.7%		7.9	64%	60%	5.3	4.1%		8.2	67%	62%	5.0
South County East	OLD BAPTIST ROAD 46	1	115	12.47	48.7	54.4		Base Year		17.6	36%	32%	36.8	6.7%		18.8	39%	35%	35.6	4.1%		19.6	40%	36%	34.8
South County East	OLD BAPTIST ROAD 46	2	115	12.47	48.9	51.9		Base Year		18.7	38%	36%	33.2	6.7%		20.0	41%	39%	31.9	4.1%		20.8	43%	40%	31.1
South County East	PEACEDALE 59	1	34.5	12.47	24.2	27.2		Base Year		11.9	49%	44%	15.3	6.7%		12.7	53%	47%	14.5	4.1%		13.2	55%	49%	14.0
South County East	PEACEDALE 59	2	34.5	12.47	24.2	27.2		Base Year		9.6	40%	35%	17.6	6.7%		10.2	42%	38%	17.0	4.1%		10.7	44%	39%	16.5
South County East	QUONSET 83	1	34.5	12.47	25.6	26.7		Base Year		15.8	62%	59%	10.9	6.7%		16.8	66%	63%	9.9	4.1%		17.5	68%	66%	9.2
South County East	TOWER HILL 88	1	115	12.47	50.0	60.0		Base Year		28.3	57%	47%	31.7	6.7%		30.2	60%	50%	29.8	4.1%		31.5	63%	53%	28.5
South County East	WAKEFIELD 17	4	34.5	12.47	12.9	13.5		Base Year		7.7	60%	57%	5.8	6.7%		8.2	64%	61%	5.3	4.1%		8.6	66%	64%	4.9
South County East	WAKEFIELD 17	3T	34.5	12.47	12.9	13.5		Base Year		9.9	77%	73%	3.6	6.7%		10.6	82%	79%	2.9	4.1%		11.1	86%	82%	2.4
South County East	WAKEFIELD 17	5T	34.5	12.47	12.9	13.5		Base Year		9.2	71%	68%	4.3	6.7%		9.8	76%	73%	3.7	4.1%		10.2	79%	76%	3.3
South County East	WEST KINGSTON 62	1	115	34.5	43.9	55.7		Base Year		25.4	58%	46%	30.3	6.7%		26.8	61%	48%	28.9	4.1%		27.7	63%	50%	28.0
South County East	WEST KINGSTON 62	2	115	34.5	75.8	93.5		Base Year		36.3	48%	39%	57.2	6.7%		38.7	51%	41%	54.8	4.1%		40.3	53%	43%	53.2
South County West	ASHAWAY 43	1	34.5	12.47	8.4	9.1	Planned retire 2014 (Hopkinton related)	Base Year		8.0	95%	88%	1.1	6.7%		8.5	101%	93%	0.6	4.1%		8.9	106%	98%	0.2
South County West	HOPE VALLEY 41	1	34.5	12.47	7.3	9.3	Planned retire 2014 (Hopkinton related)	Base Year		6.1	84%	66%	3.2	6.7%		6.5	89%	70%	2.8	4.1%		6.7	93%	72%	2.6
South County West	HOPKINTON	1	115	12.47	50.0	55.0	Expected in-service 2014	Base Year																	
South County West	HOPKINTON	2	115	12.47	50.0	55.0	Expected in-service 2014	Base Year																	
South County West	KENYON 68	1	115	12.47	49.7	53.7		Base Year		21.9	44%	41%	31.8	6.7%		23.3	47%	43%	30.4	4.1%		24.3	49%	45%	29.4
South County West	KENYON 68	2	115	12.47	49.7	53.7		Base Year		15.4	31%	29%	38.3	6.7%		16.4	33%	31%	37.3	4.1%		17.1	34%	32%	36.6
South County West	LANGWORTHY 86	1	34.5	12.47	8.2	9.3	Planned retire 2014 (Hopkinton related)	Base Year		6.9	84%	74%	2.4	6.7%		7.3	89%	78%	2.0	4.1%		7.6	93%	82%	1.7
South County West	LANGWORTHY 86	1	34.5	12.47	12.0	14.0	Expected in-service 2014	Base Year																	
South County West	WESTERLY 16	2	34.5	12.47	25.6	26.7	Planned retire 2014 (Hopkinton related)	Base Year		19.7	77%	74%	7.0	6.7%		21.1	82%	79%	5.6	4.1%		21.9	86%	82%	4.8
South County West	WESTERLY 16	4	34.5	12.47	25.6	26.7	Planned retire 2014 (Hopkinton related)	Base Year		14.9	58%	56%	11.8	6.7%		15.8	62%	59%	10.9	4.1%		16.5	64%	62%	10.2
South County West	WOOD RIVER 85	10	115	34.5	48.2	52.4		Base Year		37.8	78%	72%	14.6	6.7%		40.3	84%	77%	12.1	4.1%		42.0	87%	80%	10.4
South County West	WOOD RIVER 85	20	115	34.5	91.2	106.6		Base Year		26.2	29%	25%	80.4	6.7%		28.0	31%	26%	78.6	4.1%		29.1	32%	27%	77.5
Tiverton	TIVERTON 33	1	115	12.47	33.4	33.0		Base Year		14.9	45%	45%	18.2			15.4	46%	47%	17.6			15.6	47%	47%	17.4
Tiverton	TIVERTON 33	2	115	12.47	49.4	53.7		Base Year		16.4	33%	31%	37.3			17.0	35%	32%	36.7			17.2	35%	32%	36.5

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			System Voltage (kV)		Rating (MVA)			2014						2015						2016					
Study Area	Substation	Tranf. ID.	From	To	SN	SE	Comments	Growth	Spot	MVA	% SN	% SE	N-1 Capacity	Growth	Spot	MVA	% SN	% SE	N-1 Capacity	Growth	Spot	MVA	% SN	% SE	N-1 Capacity
Blackstone Valley North	Farnum #105	T1	115	23	37.3	37.3		0.9%		4.0	11%	11%	33.3	0.6%		4.0	11%	11%	33.3	0.3%		4.0	11%	11%	33.3
Blackstone Valley North	Highland Dr	T1	115	13.8	53	62	Estimated in-service 2014	0.9%		20.5	39%	33%	41.5	0.6%		20.7	39%	33%	41.3	0.3%		20.7	39%	33%	41.3
Blackstone Valley North	Highland Dr	T2	115	13.8	53	62	Estimated in-service 2014	0.9%		20.6	39%	33%	41.4	0.6%		20.8	39%	33%	41.2	0.3%		20.8	39%	34%	41.2
Blackstone Valley North	Nasonville #127	T271	115	13.8	47.8	47.8		0.9%		30.5	64%	64%	17.3	0.6%		30.7	64%	64%	17.1	0.3%		30.8	64%	64%	17.0
Blackstone Valley North	Riverside #108	T81	115	13.8	41.83	45.23		0.9%		20.9	50%	46%	24.3	0.6%		21.0	50%	46%	24.2	0.3%		21.1	50%	47%	24.1
Blackstone Valley North	Riverside #108	T82	115	13.8	49.62	58.74		0.9%		25.2	51%	43%	33.6	0.6%		25.3	51%	43%	33.4	0.3%		25.4	51%	43%	33.3
Blackstone Valley North	Staples #112	T124	115	13.8	47.8	47.8		0.9%		26.7	56%	56%	21.1	0.6%		26.9	56%	56%	20.9	0.3%		27.0	56%	56%	20.8
Blackstone Valley North	West Farnum	T1	115	13.8	20	20	Retire 2012																		
Blackstone Valley North	Woonsocket	T1	115	13.8	47.8	50	In-Service 2012	0.9%		25.6	54%	51%	24.4	0.6%		25.8	54%	52%	24.2	0.3%		25.9	54%	52%	24.1
Blackstone Valley South	Central Falls #104	North (J5 & J7)	13.8	4.16	3	3		0.9%		2.4	80%	80%	0.6	0.6%		2.4	80%	80%	0.6	0.3%		2.4	81%	81%	0.6
Blackstone Valley South	Central Falls #104	South (J1 & J3)	13.8	4.16	3.12	3.12		0.9%		1.5	46%	46%	1.7	0.6%		1.5	47%	47%	1.7	0.3%		1.5	47%	47%	1.7
Blackstone Valley South	Centre Street #106	(J1, J3, J7)	13.8	4.16	3.1	3.1		0.9%		2.4	78%	78%	0.7	0.6%		2.4	79%	79%	0.7	0.3%		2.4	79%	79%	0.7
Blackstone Valley South	Cottage St #109	(J1, J3, J5)	13.8	4.16	8.25	9.43		0.9%		6.3	77%	67%	3.1	0.6%		6.4	77%	67%	3.1	0.3%		6.4	77%	68%	3.1
Blackstone Valley South	Crossman St #111	(J1 & J3)	13.8	4.16	8.26	9.44		0.9%		3.2	39%	34%	6.3	0.6%		3.2	39%	34%	6.2	0.3%		3.2	39%	34%	6.2
Blackstone Valley South	Daggett Ave #113	(J1 & J2)	13.8	4.16	4.23	5.02		0.9%		2.2	51%	43%	2.9	0.6%		2.2	51%	43%	2.9	0.3%		2.2	51%	43%	2.8
Blackstone Valley South	Front #24	J1	13.8	4.16	3.1	3.1		0.9%		1.1	37%	37%	2.0	0.6%		1.1	37%	37%	2.0	0.3%		1.2	37%	37%	1.9
Blackstone Valley South	Hyde Avenue #28	(J1 & J2)	13.8	4.16	5.25	5.25		0.9%		2.0	38%	38%	3.2	0.6%		2.0	38%	38%	3.2	0.3%		2.0	39%	39%	3.2
Blackstone Valley South	Lee St. #30	(J1, J3, J5)	13.8	4.16	7	7		0.9%		4.9	70%	70%	2.1	0.6%		4.9	71%	71%	2.1	0.3%		5.0	71%	71%	2.0
Blackstone Valley South	Pawtucket No.1 #107	T71	115	13.8	48	48		0.9%		27.2	57%	57%	20.8	0.6%		27.3	57%	57%	20.7	0.3%		27.4	57%	57%	20.6
Blackstone Valley South	Pawtucket No.1 #107	T73A	115	13.8	48	48		0.9%		40.4	84%	84%	7.6	0.6%		40.7	85%	85%	7.3	0.3%		40.8	85%	85%	7.2
Blackstone Valley South	Pawtucket No.1 #107	T74	115	13.8	48	48		0.9%		29.7	62%	62%	18.3	0.6%		29.9	62%	62%	18.1	0.3%		30.0	62%	62%	18.0
Blackstone Valley South	Pawtucket No.2 #148	T1	13.8	4.16	7.6	9.36		0.9%		2.0	27%	22%	7.3	0.6%		2.1	27%	22%	7.3	0.3%		2.1	27%	22%	7.3
Blackstone Valley South	Pawtucket No.2 #148	T2	13.8	4.16	7.6	9.36		0.9%		3.1	41%	33%	6.2	0.6%		3.1	41%	34%	6.2	0.3%		3.2	42%	34%	6.2
Blackstone Valley South	Southeast #60		13.8	4.16	7	7		0.9%		2.4	34%	34%	4.6	0.6%		2.4	34%	34%	4.6	0.3%		2.4	34%	34%	4.6
Blackstone Valley South	Valley #102	T21	115	13.8	38.36	45.95		0.9%		23.2	60%	50%	22.8	0.6%		23.3	61%	51%	22.6	0.3%		23.4	61%	51%	22.6
Blackstone Valley South	Valley #102	T22	115	13.8	31.6	40.29		0.9%		19.8	63%	49%	20.5	0.6%		19.9	63%	49%	20.4	0.3%		19.9	63%	49%	20.4
Blackstone Valley South	Valley #102	T23	115	24	42.01	51.51		0.9%		3.9	9%	8%	47.6	0.6%		3.9	9%	8%	47.6	0.3%		3.9	9%	8%	47.6
Blackstone Valley South	Washington #126	T261	115	13.8	48	48		0.9%		25.7	54%	54%	22.3	0.6%		25.9	54%	54%	22.1	0.3%		25.9	54%	54%	22.1
Blackstone Valley South	Washington #126	T262	115	13.8	59.27	57.4		0.9%		26.7	45%	47%	30.7	0.6%		26.9	45%	47%	30.5	0.3%		26.9	45%	47%	30.5
Central RI East	APPONAUG 3	3	23	12.47	15.5	19.6		4.0%		8.7	56%	44%	10.9	3.1%		9.4	61%	48%	10.2	2.5%		9.6	62%	49%	10.0
Central RI East	APPONAUG 3	4	23	12.47	11.9	12.6		4.0%		9.1	76%	72%	3.5	3.1%		9.1	76%	72%	3.5	2.5%		9.3	78%	74%	3.3
Central RI East	AUBURN 73	1	23	4.16	10.6	11.8		4.0%		5.4	51%	45%	6.5	3.1%		5.5	52%	47%	6.3	2.5%		5.7	54%	48%	6.2
Central RI East	AUBURN 73	2	23	4.16	9.7	10.6		4.0%		3.6	37%	34%	7.1	3.1%		3.7	38%	35%	6.9	2.5%		3.8	39%	36%	6.9
Central RI East	DRUMROCK 14	3	115	23/12.47	53.0	76.0		4.0%		33.5	63%	44%	42.5	3.1%		34.6	65%	45%	41.5	2.5%		35.4	67%	47%	40.6
Central RI East	DRUMROCK 14	4	115	23	89.0	107.4		4.0%		45.3	51%	42%	62.1	3.1%		46.7	52%	43%	60.7	2.5%		47.9	54%	45%	59.5
Central RI East	DRUMROCK 14	5	115	23/12.47	107.0	107.0		4.0%		63.1	59%	59%	43.9	3.1%		65.1	61%	61%	41.9	2.5%		66.7	62%	62%	40.3
Central RI East	KILVERT STREET 86	1	115	12.47	67.0	84.0	Expected In-Service 2015							3.1%		25.7	38%	31%	58.3	2.5%		26.4	39%	31%	57.6
Central RI East	KILVERT STREET 87	2	115	12.47	67.0	84.0		4.0%		31.3	47%	37%	52.7	3.1%		19.3	29%	23%	64.7	2.5%		19.8	30%	24%	64.2
Central RI East	LAKEWOOD 57	1	23	4.16	10.1	10.6		4.0%		6.7	67%	63%	3.9	3.1%		6.9	69%	65%	3.7	2.5%		7.1	70%	67%	3.5
Central RI East	LAKEWOOD 57	2	23	4.16	10.2	11.5		4.0%		3.6	36%	32%	7.8	3.1%		2.1	21%	19%	9.3	2.5%		2.2	22%	19%	9.3
Central RI East	LINCOLN AVENUE 72	1	115	12.47	52.1	54.9		4.0%		27.5	53%	50%	27.4	3.1%		25.3	49%	46%	29.6	2.5%		25.9	50%	47%	29.0
Central RI East	LINCOLN AVENUE 72	2	115	12.47	52.1	54.9		4.0%		28.0	54%	51%	27.0	3.1%		27.6	53%	50%	27.3	2.5%		28.3	54%	52%	26.6
Central RI East	PAWTUXET 31	1	23	4.16	4.3	5.1	Planned retire 2015	4.0%		4.0	92%	78%	1.1												
Central RI East	PONTIAC 27	1	115	12.47	50.7	53.3		4.0%		22.9	45%	43%	30.4	3.1%		23.6	47%	44%	29.7	2.5%		24.2	48%	45%	29.2
Central RI East	PONTIAC 27	2	115	12.47	46.5	51.9		4.0%		28.5	61%	55%	23.4	3.1%		29.4	63%	57%	22.5	2.5%		30.1	65%	58%	21.8
Central RI East	SOCKANOSSET 24	1	115	23	50.3	56.8		4.0%		30.3	60%	53%	26.5	3.1%		31.2	62%	55%	25.6	2.5%		32.0	64%	56%	24.8
Central RI East	SOCKANOSSET 24	2	115	23	50.4	57.0		4.0%		27.6	55%	48%	29.4	3.1%		28.5	57%	50%	28.6	2.5%		29.2	58%	51%	27.9
Central RI East	WARWICK 52	1	23	12.47	11.6	12.7		2.2%		10.9	94%	86%	1.8	2.9%		8.4	72%	66%	4.3	1.9%		8.5	73%	67%	4.2
Central RI East	WARWICK 52	4	23	12.47	12.0	12.0		2.2%		8.6	72%	72%	3.4	2.9%		8.8	74%	74%	3.2	1.9%		9.0	75%	75%	3.0
Central RI West	ANTHONY	1	23	12.47	7.8	8.1		2.2%		7.3	93%	90%	0.8	2.9%		5.0	64%	62%	3.1	1.9%		5.1	65%	63%	3.0
Central RI West	ANTHONY	2	23	12.47	7.8	8.1		2.2%		7.4	95%	91%	0.7	2.9%		4.6	59%	57%	3.5	1.9%		4.7	60%	58%	3.4
Central RI West	ARCTIC	1	23	4.16	5.0	5.0		2.2%		3.4	68%	68%	1.6	2.9%		3.3	66%	66%	1.7	1.9%		3.4	68%	68%	1.6
Central RI West	ARCTIC	2	23	4.16	6.7	7.4		2.2%		3.2	48%	43%	4.2	2.9%		0.2	4%	3%	7.2	1.9%		0.2	4%	3%	7.2
Central RI West	COVENTRY	1	23	12.47	11.4	13.5		2.2%		9.6	84%	71%	3.9	2.9%		9.9	87%	73%	3.6	1.9%		10.1	89%	75%	3.4
Central RI West	COVENTRY MITS	1	34.5	12.47	13.0	14.0	In-Service 2013	2.2%		9.4	72%	67%	4.6	2.9%		9.7	74%	69%	4.3	1.9%		9.8	76%	70%	4.2
Central RI West	DIVISION ST	1	34.5	12.47	23.7	27.6		2.2%		14.1	60%	51%	13.5	2.9%		15.6	66%	57%	12.0	1.9%		15.9	67%	58%	11.7
Central RI West	DIVISION ST	2	34.5	12.47	23.7	27.6		2.2%		10.4	44%	38%	17.2	2.9%		10.7	45%	39%	16.9	1.9%		10.9	46%	39%	16.7
Central RI West	HOPE	1	23	12.47	7.5	8.5		2.2%		6.2	83%	73%	2.3	2.9%		4.7	62%	55%	3.8	1.9%		4.8	63%	56%	3.7
Central RI West	HOPE	2*	23	12.47	13.7	16.5		2.2%		10.0	74%	61%	6.5	2.9%		8.3	61%	50%	8.2	1.9%		8.4	62%	51%	8.1
Central RI West	HOPKINS HILL	1*	34.5	12.47	48.8	51.0		2.2%		22.8	47%	45%	28.2	2.9%		20.6	42%	40%	30.4	1.9%		21.0	43%	41%	30.0
Central RI West	HOPKINS HILL	2*	34.5	12.47	49.2	52.0		2.2%		30.4	62%	58%	21.6	2.9%		30.0	61%	58%	22.0	1.9%		30.6	62%	59%	21.4
Central RI West	HUNT RIVER	2	34.5	12.47	11.2	12.7	Planned retire 2017 - Flood Mitigation	2.2%		4.9	43%	39%	7.8	2.9%		5.0	45%	39%	7.7	1.9%		5.1	45%	40%	7.6
Central RI West	KENT COUNTY	5	115	12.47	50.0	58.0	Expected In-Service 2017																		
Central RI West	KENT COUNTY	6	115	12.47	50.7	58.9		2.2%		41.4	82%	70%	17.5	2.9%		36.6	72%	62%	22.3	1.9%		37.3	74%	63%	21.6
Central RI West	KENT COUNTY	1*	115	34.5	57.3	67.6		2.2%		33.9	59%	50%	33.7	2.9%		34.9	61%	52%	32.7	1.9%		35.5	62%	53%	32.1
Central RI West	KENT COUNTY	2*	115	34.5	66.3	69.9		2.2%		35.3	53%	51%	34.6	2.9%		36.3	55%	52%	33.6	1.9%		37.0	56%	53%	32.9
Central RI West	KENT COUNTY	7*	115	34.5	57.3	68.8		2.2%		33.1	58%	48%	35.7	2.9%		34.1	60%	50%	34.7	1.9%		34.7	61%	50%	34.1
Central RI West	NATICK	1	23	12.47	13.2	14.3		2.2%		9.5	72%	66%	4.8	2.9%		8.3	63%	58%	6.0	1.9%		8.4	64%	59%	5.9
Central RI West	NATICK	2	23	12.47	13.5	14.5		2.2%		6.6	49%	46%	7.9	2.9%		6.8	50%	47%	7.7	1.9%		6.9	51%	48%	7.6
Central RI West	WARWICK MALL	1	23	12.47	8.8	8.9		2.2%		4.3	49%	48%	4.6	2.9%		4.4	50%	49%	4.5	1.9%		4.5	51%	51%	4.4
Central RI West	WARWICK MALL	2	23	12.47	8.7	9.1		2.2%		2.9	33%	32%	6.2	2.9%		2.9	34%	32%	6.2	1.9%		3.0	34%	33%	6.1

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			System Voltage (kV)		Rating (MVA)			2014						2015						2016					
Study Area	Substation	Tranf. ID.	From	To	SN	SE	Comments	Growth	Spot	MVA	% SN	% SE	N-1 Capacity	Growth	Spot	MVA	% SN	% SE	N-1 Capacity	Growth	Spot	MVA	% SN	% SE	N-1 Capacity
Central RI West	NEW LONDON AVE	1	115	12.47	55.0	60.0	Expected In-Service 2015							2.9%		26.2	48%	44%	33.8	1.9%		26.9	49%	45%	33.1
East Bay	BARRINGTON 4	1	23	12.47	35.19	35.09		1.0%		20.4	58%	58%	14.7	1.0%		20.5	58%	58%	14.6	0.7%		20.6	59%	59%	14.5
East Bay	BRISTOL 51	1	115	12.47	56.9	63.4		1.0%		19.3	34%	31%	44.1	1.0%		19.5	34%	31%	43.9	0.7%		19.6	34%	31%	43.8
East Bay	BRISTOL 51	2	23	12.47	25.1	29.8		1.0%		9.8	39%	33%	20.0	1.0%		9.9	39%	33%	19.9	0.7%		9.9	40%	33%	19.9
East Bay	KENT CORNERS 47	T1	23	4.16	7.14	7.53		1.0%		2.8	39%	37%	4.7	1.0%		2.8	39%	37%	4.7	0.7%		2.8	40%	38%	4.7
East Bay	KENT CORNERS 47	T2	23	4.16	6.82	8.07		1.0%		4.5	67%	56%	3.5	1.0%		4.6	67%	57%	3.5	0.7%		4.6	68%	57%	3.5
East Bay	PHILLIPSDALE 20	T1	115	23	56	56		1.0%		10.9	19%	19%	45.1	1.0%		11.0	20%	20%	45.0	0.7%		11.0	20%	20%	45.0
East Bay	PHILLIPSDALE 20	T2	115	23	45.32	56.75		1.0%		8.1	18%	14%	48.6	1.0%		8.2	18%	15%	48.5	0.7%		8.3	18%	15%	48.5
East Bay	PHILLIPSDALE 20	T3	23	12.47	25.16	28.87		1.0%		13.0	52%	45%	15.9	1.0%		13.1	52%	45%	15.8	0.7%		13.2	52%	46%	15.7
East Bay	WAMPANOAG 48	T1	115	12.47	42.83	52.72		1.0%		29.6	69%	56%	23.1	1.0%		29.8	70%	57%	22.9	0.7%		30.0	70%	57%	22.7
East Bay	WAMPANOAG 48	T2	115	12.47	52.36	55.33		1.0%		27.0	51%	49%	28.4	1.0%		27.2	52%	49%	28.2	0.7%		27.3	52%	49%	28.0
East Bay	WARREN 5	5	115	23	60.96	65.05		1.0%		8.3	14%	13%	56.8	1.0%		8.4	14%	13%	56.7	0.7%		8.4	14%	13%	56.6
East Bay	WARREN 5	6	115	23	59.6	64.17		1.0%		21.5	36%	33%	42.7	1.0%		21.7	36%	34%	42.5	0.7%		21.8	37%	34%	42.3
East Bay	WARREN 5	T1	115	12.47	48.28	53.43		1.0%		14.4	30%	27%	39.0	1.0%		14.5	30%	27%	38.9	0.7%		14.6	30%	27%	38.8
East Bay	WARREN 5	T2	115	12.47	50.62	59.57		1.0%		18.1	36%	30%	41.5	1.0%		18.2	36%	31%	41.4	0.7%		18.3	36%	31%	41.3
East Bay	WATERMAN AVENUE 78	T1	23	12.47	16.36	18.26		1.0%		7.5	46%	41%	10.8	1.0%		7.5	46%	41%	10.8	0.7%		7.6	46%	41%	10.7
East Bay	WATERMAN AVENUE 78	T2	23	12.47	16.36	18.26		1.0%		6.2	38%	34%	12.0	1.0%		6.3	38%	34%	12.0	0.7%		6.3	39%	35%	12.0
Newport	Bailey Brook	191	23	4.16	8.3	8.7	Planned retire 2015 (Newport related)	3.5%		1.8	22%	21%	6.9												
Newport	Bailey Brook	192	23	4.16	8.6	10.4	Planned retire 2015 (Newport related)	3.5%		1.5	17%	14%	8.9												
Newport	Clarke St	651	23	4.16	4.1	4.3	Planned Upgrade 2015	3.5%		3.7	90%	86%	0.6	2.7%		3.2	78%	74%	1.1	2.2%		3.2	80%	74%	1.1
Newport	Clarke St	652	23	4.16	4.5	5.0		3.5%		2.2	110%	105%	-0.1	2.7%		2.9	65%	58%	2.1	2.2%		3.0	66%	60%	2.0
Newport	Dexter	361	115	69	121.0	130.0		3.5%		74.0	61%	57%	56.0	2.7%		76.0	63%	58%	54.0	2.2%		77.7	64%	60%	52.3
Newport	Dexter	362	115	69	61.0	65.0		3.5%		31.9	52%	49%	33.1	2.7%		32.7	54%	50%	32.3	2.2%		33.5	55%	52%	31.5
Newport	Dexter	363	115	69	61.0	65.0		3.5%		31.9	52%	49%	33.1	2.7%		32.7	54%	50%	32.3	2.2%		33.5	55%	52%	31.5
Newport	Dexter	364	115	13.8	44.6	47.4		3.5%		27.0	61%	57%	20.4	2.7%		27.8	62%	59%	19.6	2.2%		28.4	64%	60%	19.0
Newport	Eldred	451	23	4.16	7.9	9.6	Planned retire 2015	3.5%		5.9	74%	61%	3.7												
Newport	Eldred NEW	1	23	4.16	5.8	7.0	Expected in-service 2015									2.7	47%	39%	4.3	2.2%		2.8	48%	40%	4.2
Newport	Eldred NEW	2	23	4.16	5.8	7.0	Expected in-service 2015									2.1	36%	30%	4.9	2.2%		2.2	37%	31%	4.8
Newport	Gate 2	381	69	23	54.2	63.7		3.5%		23.2	43%	36%	40.5	2.7%		17.3	32%	27%	46.4	2.2%		17.7	33%	28%	46.0
Newport	Gate 2	382	69	23	55.0	60.0	Expected in-service 2015				0%					17.3	31%	29%	42.7	2.2%		17.7	32%	30%	42.3
Newport	Gate 2	731	23	4.16	8.1	8.7	Planned retire 2015 (Newport related)	3.5%		5.1	63%	59%	3.6												
Newport	Harrison	321	23	4.16	8.3	9.7		3.5%		2.7	33%	28%	7.0	2.7%		2.8	33%	29%	6.9	2.2%		2.9	34%	30%	6.8
Newport	Harrison	322	23	4.16	8.1	10.1		3.5%		5.0	62%	50%	5.1	2.7%		5.1	63%	50%	5.0	2.2%		5.2	65%	51%	4.9
Newport	Hospital	461	23	4.16	4.1	4.3		3.5%		2.5	63%	58%	1.8	2.7%		2.6	64%	60%	1.7	2.2%		2.7	65%	63%	1.6
Newport	Hospital	462	23	4.16	4.1	4.3		3.5%		2.0	50%	47%	2.3	2.7%		2.1	52%	49%	2.2	2.2%		2.1	53%	49%	2.2
Newport	Jepson	341	23	4.16	9.7	10.4	Planned retire 2015 (Newport related)	3.5%		2.7	27%	26%	7.7												
Newport	Jepson	371	69	23	16.5	18.5		3.5%		6.5	39%	35%	12.0	2.7%	-1.1	5.6	34%	30%	12.9	2.2%		5.7	34%	31%	12.8
Newport	Jepson	372	69	23	23.2	24.8		3.5%		11.7	51%	47%	13.1	2.7%	-1.9	10.1	44%	41%	14.7	2.2%		10.4	45%	42%	14.4
Newport	Jepson	373	69	23	48.9	57.9		3.5%		33.9	69%	59%	24.0	2.7%	-13.0	21.9	45%	38%	36.0	2.2%		22.3	46%	39%	35.6
Newport	Jepson	374	69	13.8	42.9	48.6		3.5%		32.1	75%	66%	16.5	2.7%		22.5	52%	46%	26.1	2.2%		23.0	54%	47%	25.6
Newport	Jepson	376	69	23	15.4	16.4		3.5%		7.2	46%	44%	9.2	2.7%	-1.1	6.3	41%	38%	10.1	2.2%		6.4	41%	39%	10.0
Newport	Kingston	311	23	4.16	7.9	9.6		3.5%		6.3	80%	66%	3.3	2.7%		5.0	64%	52%	4.6	2.2%		5.1	65%	53%	4.5
Newport	Kingston	312	23	4.16	7.9	9.6		3.5%		4.2	53%	44%	5.4	2.7%		4.0	51%	42%	5.6	2.2%		4.1	52%	43%	5.5
Newport	Merton	511	23	4.16	2.2	2.4		3.5%		1.9	83%	79%	0.5	2.7%		1.9	85%	79%	0.5	2.2%		2.0	87%	83%	0.4
Newport	Merton	512	23	4.16	8.4	10.0		3.5%		4.8	57%	48%	5.2	2.7%		4.9	59%	49%	5.1	2.2%		5.0	60%	50%	5.0
Newport	Newport Sub	1	69	13.8	55.0	60.0	Expected in-service 2015							2.7%		18.1	33%	30%	41.9	2.2%		18.5	34%	31%	41.5
Newport	Newport Sub	2	69	13.8	55.0	60.0	Expected in-service 2015							2.7%		16.9	31%	28%	43.1	2.2%		17.3	31%	29%	42.7
Newport	No. Aquidneck	211	23	4.16	8.0	10.2		3.5%		5.6	70%	55%	4.6	2.7%		3.6	45%	35%	6.6	2.2%		3.6	46%	35%	6.6
Newport	So. Aquidneck	221	23	4.16	7.9	9.6		3.5%		7.4	93%	77%	2.2	2.7%		4.5	57%	47%	5.1	2.2%		4.6	59%	48%	5.0
Newport	Vernon Ave	231	23	4.16	3.6	3.9	Planned retire 2015 (Newport related)	3.5%		3.9	107%	100%	0.0												
Newport	Vernon Ave	232	23	4.16	3.6	3.9	Planned retire 2015 (Newport related)	3.5%		1.8	49%	46%	2.1												
Newport	West Howard	541	23	4.16	12.6	14.8		3.5%		8.3	66%	56%	6.5	2.7%		8.2	66%	55%	6.6	2.2%		8.4	67%	57%	6.4
Newport	West Howard	542	23	4.16	13.1	13.58		3.5%		5.5	42%	41%	8.1	2.7%		5.9	45%	43%	7.7	2.2%		6.0	46%	44%	7.6
North Central RI	Centerdale #50	T1	23	4.16	7.1	7.54		2.9%		3.2	45%	42%	4.3	2.5%		3.3	46%	43%	4.3	2.3%		3.3	47%	44%	4.2
North Central RI	Centerdale #50	T3	23	12.47	7.93	8.34		2.9%		5.3	66%	63%	3.1	2.5%		5.4	68%	65%	2.9	2.3%		5.5	70%	66%	2.8
North Central RI	Chopmist #34	T1	23	12.47	15.96	16.42		2.9%		10.5	66%	64%	5.9	2.5%		10.8	68%	66%	5.6	2.3%		11.1	69%	67%	5.4
North Central RI	Chopmist #34	T2	23	12.47	13.84	13.57		2.9%		7.3	53%	54%	6.2	2.5%		7.5	54%	55%	6.1	2.3%		7.7	55%	57%	5.9
North Central RI	Chopmist #34	T3	23	12.47	12.81	13.94		2.9%		6.5	51%	47%	7.4	2.5%		6.7	52%	48%	7.3	2.3%		6.8	53%	49%	7.1
North Central RI	Farnum Pike #23	T1	115	12.47	64.8	64.8		2.9%		22.0	34%	34%	42.8	2.5%		22.5	35%	35%	42.3	2.3%		23.1	36%	36%	41.7
North Central RI	Farnum Pike #23	T2	115	12.47	64.8	64.8		2.9%		25.3	39%	39%	39.5	2.5%		25.9	40%	40%	38.9	2.3%		26.5	41%	41%	38.3
North Central RI	Johnston #18	T1	115	12.47	25	35		2.9%		14.8	59%	42%	20.2	2.5%		15.2	61%	43%	19.8	2.3%		17.1	68%	49%	17.9
North Central RI	Johnston #18	T1 - 23	115	23	63.4	77		2.9%		22.4	35%	29%	54.6	2.5%		23.0	36%	30%	54.0	2.3%		23.5	37%	30%	53.5
North Central RI	Johnston #18	T3	115	12.47	53.68	56.33		2.9%		24.5	46%	43%	31.9	2.5%		25.1	47%	45%	31.2	2.3%		27.3	51%	48%	29.1
North Central RI	Johnston #18	T4	115	12.47	68.6	74		2.9%		29.2	43%	39%	44.8	2.5%		30.0	44%	40%	44.0	2.3%		30.6	45%	41%	43.4
North Central RI	Johnston #18	T2- 23	115	23	80	90		2.9%		36.6	46%	41%	53.4	2.5%		37.5	47%	42%	52.5	2.3%		38.4	48%	43%	51.6
North Central RI	Manton #69	T2	23	12.47	25.46	26.66		2.9%		19.0	75%	71%	7.6	2.5%		19.5	77%	73%	7.2	2.3%		17.8	70%	67%	8.9
North Central RI	Putnam Pike #38	T1	115	12.47	64.94	68.79		2.9%		28.6	44%	42%	40.2	2.5%		29.3	45%	43%	39.5	2.3%		30.0	46%	44%	38.8
North Central RI	Putnam Pike #38	T2	115	12.47	64.94	68.79		2.9%		20.7	32%	30%	48.1	2.5%		21.2	33%	31%	47.6	2.3%		21.7	33%	32%	47.1
North Central RI	Shun Pike #35	T1	115	12.47	68.6	74	Expected in-service 2018																		
North Central RI	Shun Pike SIMS	T3	115	13.2	27	30	Expected in-service 2014	2.9%		11.0	41%	37%	19.0	2.5%		11.3	42%	38%	18.7	2.3%		11.5	43%	38%	18.5
North Central RI	West Cranston #21	T1	115	12.47	27.78	29.91		2.9%		10.8	39%	36%	19.1	2.5%		11.1	40%	37%	18.9	2.3%		9.8	35%	33%	20.2
North Central RI	West Cranston #21	T2	115	12.47	27.76	29.86		2.9%		20.6	74%	69%	9.2	2.5%		21.2	76%	71%	8.7	2.3%		20.0	72%	67%	9.8
North Central RI	West Greenville # 45	T3	23	12.47	11.91	13.56		2.9%		2.8	24%	21%	10.7	2.5%		2.9	24%	21%	10.7	2.3%		3.0	25%	22%	10.6
North Central RI	Wolf Hill #19	T1	115	23	65.01	69.83		2.9%		29.0	45%	42%	40.8	2.5%		29.8	46%	43%	40.1	2.3%		30.5	47%	44%	39.4
Providence	Admiral Street #9	T1	23	11/4.16	15	15		1.0%		2.8	18%	18%	12.2	0.7%		2.8	19%	19%	12.2	0.6%		2.8	19%	19%	12.2
Providence	Admiral Street #9	T2	23	11/4.16	15	15		1.0%		3.5	24%	24%	11.5	0.7%		3.6	24%	24%	11.4	0.6%		3.6	24%	24%	11.4
Providence	Admiral Street #9	T3	115	23	62.1	63.7		1.0%		22.9	37%	36%	40.8	0.7%		23.0	37%	36%	40.7	0.6%		23.2	37%	36%	40.5

Transformers - Normal Configuration Summary
2012 Annual Plan for Rhode Island

			System Voltage (kV)		Rating (MVA)			2014						2015						2016					
Study Area	Substation	Tranf. ID.	From	To	SN	SE	Comments	Growth	Spot	MVA	% SN	% SE	N-1 Capacity	Growth	Spot	MVA	% SN	% SE	N-1 Capacity	Growth	Spot	MVA	% SN	% SE	N-1 Capacity
Providence	Admiral Street #9	T4	115	23	63	64.9		1.0%		22.3	35%	34%	42.6	0.7%		22.5	36%	35%	42.4	0.6%		22.6	36%	35%	42.3
Providence	Admiral Street #9	T5	23	4.16	15.13	15.36		1.0%		5.9	39%	39%	9.4	0.7%		6.0	39%	39%	9.4	0.6%		6.0	40%	39%	9.4
Providence	Clarkson Street #13	T1	115	12.47	65.46	81.01		1.0%		36.3	55%	45%	44.7	0.7%		36.5	56%	45%	44.5	0.6%		36.7	56%	45%	44.3
Providence	Clarkson Street #13	T2	115	12.47	65.16	80.24		1.0%		32.7	50%	41%	47.5	0.7%		33.0	51%	41%	47.3	0.6%		35.1	54%	44%	45.1
Providence	Dyer St #2	T1	11.5	4.16	18.27	19.78		1.0%		8.0	44%	40%	11.8	0.7%		8.0	44%	41%	11.8	0.6%		8.1	44%	41%	11.7
Providence	Dyer St #2	T2	11.5	4.16	18.25	19.74		1.0%		5.3	29%	27%	14.5	0.7%		5.3	29%	27%	14.4	0.6%		5.4	29%	27%	14.4
Providence	East George St. #77	T1	23	4.16	12.59	15.27		1.0%		4.3	35%	28%	10.9	0.7%		4.4	35%	29%	10.9	0.6%		4.4	35%	29%	10.9
Providence	East George St. #77	T2	23	4.16	12.59	15.27		1.0%		4.7	37%	31%	10.6	0.7%		4.7	38%	31%	10.5	0.6%		4.8	38%	31%	10.5
Providence	Elmwood #7 (12.47 kV)	T2	23	12.47	40.58	45.78		1.0%		29.8	73%	65%	16.0	0.7%		30.0	74%	66%	15.8	0.6%		30.2	74%	66%	15.6
Providence	Franklin Square #11	2207	11.5	23	16.06	18.75		1.0%		7.1	44%	38%	11.7	0.7%		7.1	44%	38%	11.6	0.6%		7.2	45%	38%	11.6
Providence	Franklin Square #11	2210	11.5	23	17.14	15.85		1.0%		10.6	62%	67%	5.3	0.7%		10.6	62%	67%	5.2	0.6%		10.7	62%	67%	5.2
Providence	Franklin Square #11	2220	11.5	23	17.7	19.3		1.0%		15.2	86%	79%	4.1	0.7%		15.3	87%	79%	4.0	0.6%		15.4	87%	80%	3.9
Providence	Franklin Square #11	2260	11.5	23	16.06	18.75		1.0%		5.1	32%	27%	13.6	0.7%		5.2	32%	27%	13.6	0.6%		5.2	32%	28%	13.6
Providence	Franklin Square #11	3320	11.5	34.5	25.87	29.66		1.0%		7.6	29%	26%	22.0	0.7%		7.7	30%	26%	22.0	0.6%		7.7	30%	26%	21.9
Providence	Franklin Square #11	3324	11.5	34.5	25.75	29.5		1.0%		9.8	38%	33%	19.7	0.7%		9.9	38%	33%	19.6	0.6%		9.9	39%	34%	19.6
Providence	Franklin Square #11	T1	115	11.5	50.65	61.04		1.0%		22.9	45%	37%	38.2	0.7%		23.0	45%	38%	38.0	0.6%		23.2	46%	38%	37.9
Providence	Franklin Square #11	T2	115	11.5	51.24	56.69		1.0%		16.3	32%	29%	40.4	0.7%		16.4	32%	29%	40.3	0.6%		16.5	32%	29%	40.2
Providence	Franklin Square #11	T3	115	11.5	51.24	56.69		1.0%		28.3	55%	50%	28.4	0.7%		28.5	56%	50%	28.2	0.6%		28.7	56%	51%	28.0
Providence	Geneva #71	T1	23	4.16	11.54	14.19		1.0%		8.3	72%	59%	5.9	0.7%		8.4	73%	59%	5.8	0.6%		8.4	73%	59%	5.8
Providence	Harris Avenue #12	T1	23	4.16	11.48	12.72		1.0%		4.6	40%	36%	8.1	0.7%		4.6	40%	37%	8.1	0.6%		4.7	41%	37%	8.0
Providence	Harris Avenue #12	T2	23	4.16	9.06	11.52		1.0%		2.4	27%	21%	9.1	0.7%		2.4	27%	21%	9.1	0.6%		2.4	27%	21%	9.1
Providence	Huntington Park #67	T1	23	4.16	3	3		1.0%		2.0	65%	65%	1.0	0.7%		2.0	65%	65%	1.0	0.6%		2.0	66%	66%	1.0
Providence	Knightsville #66	T1	22.9	4.16	10.48	11.02		1.0%		6.5	62%	59%	4.5	0.7%		6.6	63%	60%	4.4	0.6%		6.6	63%	60%	4.4
Providence	Knightsville #66	T2	22.9	4.16	10.48	11.02		1.0%		4.5	43%	41%	6.5	0.7%		4.5	43%	41%	6.5	0.6%		4.5	43%	41%	6.5
Providence	Lippitt Hill #79	T1	22.9	12.47	25.11	27.54		1.0%		7.5	30%	27%	20.0	0.7%		7.6	30%	28%	19.9	0.6%		7.6	30%	28%	19.9
Providence	Lippitt Hill #79	T2	22.9	12.47	25.11	27.54		1.0%		8.8	35%	32%	18.8	0.7%		8.8	35%	32%	18.7	0.6%		8.9	35%	32%	18.7
Providence	Olneyville #6	T1	11.5	4.16	11.8	13.02		1.0%		4.8	40%	37%	8.2	0.7%		4.8	41%	37%	8.2	0.6%		4.8	41%	37%	8.2
Providence	Olneyville #6	T3	11.5	4.16	11.8	13.02		1.0%		3.2	27%	25%	9.8	0.7%		3.2	27%	25%	9.8	0.6%		3.3	28%	25%	9.8
Providence	Point Street #76	T1	115	12.47	77	89.8		1.0%		34.1	44%	38%	55.7	0.7%		34.3	45%	38%	55.5	0.6%		34.5	45%	38%	55.3
Providence	Point Street #76	T2	115	12.47	70.86	79.98		1.0%		35.4	50%	44%	44.6	0.7%		35.7	50%	45%	44.3	0.6%		35.9	51%	45%	44.1
Providence	Rochambeau Ave #37	T1	22.9	4.16	11.96	13.12		1.0%		5.0	42%	38%	8.1	0.7%		5.1	42%	39%	8.1	0.6%		5.3	44%	40%	7.9
Providence	Rochambeau Ave #37	T2	11.45	4.16	11.02	13.04		1.0%		3.7	33%	28%	9.4	0.7%		3.7	34%	28%	9.3	0.6%		3.6	32%	27%	9.5
Providence	South Street #1	24	11.5	23	9.1	10.23		1.0%		6.0	66%	59%	4.2	0.7%		6.0	66%	59%	4.2	0.6%		6.1	67%	59%	4.2
Providence	South Street #1	2201	11.5	23	9.1	10.23		1.0%		3.4	37%	33%	6.9	0.7%		3.4	37%	33%	6.8	0.6%		3.4	38%	33%	6.8
Providence	South Street #1	2216	11.5	23	10	10		1.0%		4.1	41%	41%	5.9	0.7%		4.2	42%	42%	5.8	0.6%		4.2	42%	42%	5.8
Providence	South Street #1	2248	11.5	23	12.81	14.33		1.0%		8.1	63%	56%	6.3	0.7%		8.1	63%	57%	6.2	0.6%		8.2	64%	57%	6.2
Providence	South Street #1	T1	115	11.5	66.34	78.75		1.0%		31.6	48%	40%	47.2	0.7%		31.8	48%	40%	47.0	0.6%		32.0	48%	41%	46.8
Providence	South Street #1	T2	115	11.5	66.78	77.14		1.0%		25.0	37%	32%	52.1	0.7%		25.2	38%	33%	51.9	0.6%		25.4	38%	33%	51.8
Providence	South Street #1	T3	115	11.5	72.69	91.22		1.0%		31.6	43%	35%	59.7	0.7%		31.8	44%	35%	59.4	0.6%		32.0	44%	35%	59.3
Providence	Sprague St. #36	T1	23	4.16	10.58	11.85		1.0%		2.7	26%	23%	9.1	0.7%		2.7	26%	23%	9.1	0.6%		2.8	26%	23%	9.1
Providence	Sprague St. #36	T2	23	4.16	10.79	12		1.0%		3.2	29%	26%	8.8	0.7%		3.2	30%	27%	8.8	0.6%		3.2	30%	27%	8.8
South County East	BONNET 42	2	34.5	12.47	11.3	12.2		4.0%		10.7	95%	88%	1.5	3.1%		11.0	97%	90%	1.2	2.5%		11.3	100%	93%	0.9
South County East	DAVISVILLE 84	1	115	34.5	45.3	52.1		4.0%		20.0	44%	38%	32.1	3.1%		20.6	45%	40%	31.5	2.5%		21.1	47%	40%	31.0
South County East	DAVISVILLE 84	2A	115	34.5	45.1	51.8		4.0%		24.3	54%	47%	27.5	3.1%		25.0	55%	48%	26.8	2.5%		25.6	57%	49%	26.2
South County East	LAFAYETTE 30	1	34.5	12.47	7.6	8.6		4.0%		5.7	74%	66%	2.9	3.1%		5.8	77%	67%	2.8	2.5%		6.0	79%	70%	2.6
South County East	LAFAYETTE 30	2	34.5	12.47	12.3	13.2		4.0%		9.7	79%	73%	3.5	3.1%		10.0	81%	76%	3.2	2.5%		10.3	84%	78%	2.9
South County East	OLD BAPTIST ROAD 46	1	115	12.47	48.7	54.4		4.0%		20.4	42%	38%	34.0	3.1%		21.0	43%	39%	33.4	2.5%		21.5	44%	40%	32.9
South County East	OLD BAPTIST ROAD 46	2	115	12.47	48.9	51.9		4.0%		20.8	43%	40%	31.1	3.1%		21.4	44%	41%	30.5	2.5%		22.0	45%	42%	29.9
South County East	PEACEDALE 59	1	34.5	12.47	24.2	27.2		4.0%		13.8	57%	51%	13.4	3.1%		14.2	59%	52%	13.0	2.5%		14.5	60%	53%	12.7
South County East	PEACEDALE 59	2	34.5	12.47	24.2	27.2		4.0%		11.1	46%	41%	16.1	3.1%		11.4	47%	42%	15.8	2.5%		11.7	48%	43%	15.5
South County East	QUONSET 83	1	34.5	12.47	25.6	26.7		4.0%		17.0	66%	64%	9.7	3.1%		17.5	69%	66%	9.2	2.5%		18.0	70%	67%	8.7
South County East	TOWER HILL 88	1	115	12.47	50.0	60.0		4.0%		36.9	74%	62%	23.1	3.1%		38.1	76%	64%	21.9	2.5%		39.0	78%	65%	21.0
South County East	WAKEFIELD 17	4	34.5	12.47	12.9	13.5		4.0%		8.9	69%	66%	4.6	3.1%		9.2	71%	68%	4.3	2.5%		9.4	73%	70%	4.1
South County East	WAKEFIELD 17	3T	34.5	12.47	12.9	13.5		4.0%		11.5	89%	85%	2.0	3.1%		11.9	92%	88%	1.6	2.5%		12.1	94%	90%	1.4
South County East	WAKEFIELD 17	5T	34.5	12.47	12.9	13.5		4.0%		10.6	83%	79%	2.9	3.1%		11.0	85%	81%	2.5	2.5%		11.2	87%	83%	2.3
South County East	WEST KINGSTON 62	1	115	34.5	43.9	55.7		4.0%		28.7	65%	52%	27.0	3.1%		29.5	67%	53%	26.2	2.5%		30.1	69%	54%	25.6
South County East	WEST KINGSTON 62	2	115	34.5	75.8	93.5		4.0%		41.9	55%	45%	51.6	3.1%		43.2	57%	46%	50.3	2.5%		44.3	58%	47%	49.2
South County West	ASHAWAY 43	1	34.5	12.47	8.4	9.1	Planned retire 2014 (Hopkinton related)																		
South County West	HOPE VALLEY 41	1	34.5	12.47	7.3	9.3	Planned retire 2014 (Hopkinton related)																		
South County West	HOPKINTON	1	115	12.47	50.0	55.0	Expected in-service 2014			29.5	59%	54%	25.5	3.1%		30.5	61%	55%	24.5	2.5%		31.2	62%	57%	23.8
South County West	HOPKINTON	2	115	12.47	50.0	55.0	Expected in-service 2014			25.6	51%	47%	29.4	3.1%		26.4	53%	48%	28.6	2.5%		27.1	54%	49%	27.9
South County West	KENYON 68	1	115	12.47	49.7	53.7		4.0%		22.5	45%	42%	31.2	3.1%		23.2	47%	43%	30.5	2.5%		23.8	48%	44%	29.9
South County West	KENYON 68	2	115	12.47	49.7	53.7		4.0%		17.7	36%	33%	36.0	3.1%		18.3	37%	34%	35.4	2.5%		18.7	38%	35%	35.0
South County West	LANGWORTHY 86	1	34.5	12.47	8.2	9.3	Planned retire 2014 (Hopkinton related)																		
South County West	LANGWORTHY 86	1	34.5	12.47	12.0	14.0	Expected in-service 2014	4.0%		9.9	83%	71%	4.1	3.1%		10.2	85%	73%	3.8	2.5%		10.5	87%	75%	3.5
South County West	WESTERLY 16	2	34.5	12.47	25.6	26.7	Planned retire 2014 (Hopkinton related)																		
South County West	WESTERLY 16	4	34.5	12.47	25.6	26.7	Planned retire 2014 (Hopkinton related)																		
South County West	WOOD RIVER 85	10	115	34.5	48.2	52.4		4.0%		3.5	7%	7%	48.9	3.1%		3.6	7%	7%	48.8	2.5%		3.7	8%	7%	48.7
South County West	WOOD RIVER 85	20	115	34.5	91.2	106.6		4.0%		15.4	17%	14%	91.2	3.1%		15.9	17%	15%	90.7	2.5%		16.3	18%	15%	90.3
Tiverton	TIVERTON 33	1	115	12.47	33.4	33.0				15.8	47%	48%	17.3			15.9	48%	48%	17.2			16.0	48%	48%	17.1
Tiverton	TIVERTON 33	2	115	12.47	49.4	53.7				17.4	35%	32%	36.3			17.5	35%	33%	36.2			17.6	36%	33%	36.1

Transformers - Normal Configuration Summary
2012 Annual Plan for Rhode Island

			System Voltage (kV)		Rating (MVA)																				
								2017						2018						2019					
Study Area	Substation	Tranf. ID.	From	To	SN	SE	Comments	Growth	Spot	MVA	% SN	% SE	N-1 Capacity	Growth	Spot	MVA	% SN	% SE	N-1 Capacity	Growth	Spot	MVA	% SN	% SE	N-1 Capacity
Blackstone Valley North	Farnum #105	T1	115	23	37.3	37.3		0.2%		4.0	11%	11%	33.3	0.1%		4.0	11%	11%	33.3	0.1%		4.0	11%	11%	33.3
Blackstone Valley North	Highland Dr	T1	115	13.8	53	62	Estimated in-service 2014	0.2%		20.8	39%	33%	41.2	0.1%		20.8	39%	34%	41.2	0.1%		20.8	39%	34%	41.2
Blackstone Valley North	Highland Dr	T2	115	13.8	53	62	Estimated in-service 2014	0.2%		20.9	39%	34%	41.1	0.1%		20.9	39%	34%	41.1	0.1%		20.9	39%	34%	41.1
Blackstone Valley North	Nasonville #127	T271	115	13.8	47.8	47.8		0.2%		30.9	65%	65%	16.9	0.1%		30.9	65%	65%	16.9	0.1%		30.9	65%	65%	16.9
Blackstone Valley North	Riverside #108	T81	115	13.8	41.83	45.23		0.2%		21.1	51%	47%	24.1	0.1%		21.2	51%	47%	24.1	0.1%		21.2	51%	47%	24.1
Blackstone Valley North	Riverside #108	T82	115	13.8	49.62	58.74		0.2%		25.5	51%	43%	33.3	0.1%		25.5	51%	43%	33.2	0.1%		25.5	51%	43%	33.2
Blackstone Valley North	Staples #112	T124	115	13.8	47.8	47.8		0.2%		27.0	57%	57%	20.8	0.1%		27.1	57%	57%	20.7	0.1%		27.1	57%	57%	20.7
Blackstone Valley North	West Farnum	T1	115	13.8	20	20	Retire 2012																		
Blackstone Valley North	Woonsocket	T1	115	13.8	47.8	50	In-Service 2012	0.2%		25.9	54%	52%	24.1	0.1%		26.0	54%	52%	24.0	0.1%		26.0	54%	52%	24.0
Blackstone Valley South	Central Falls #104	North (J5 & J7)	13.8	4.16	3	3		0.2%		2.4	81%	81%	0.6	0.1%		2.4	81%	81%	0.6	0.1%		2.4	81%	81%	0.6
Blackstone Valley South	Central Falls #104	South (J1 & J3)	13.8	4.16	3.12	3.12		0.2%		1.5	47%	47%	1.7	0.1%		1.5	47%	47%	1.7	0.1%		1.5	47%	47%	1.7
Blackstone Valley South	Centre Street #106	(J1, J3, J7)	13.8	4.16	3.1	3.1		0.2%		2.5	79%	79%	0.6	0.1%		2.5	79%	79%	0.6	0.1%		2.5	79%	79%	0.6
Blackstone Valley South	Cottage St #109	(J1, J3, J5)	13.8	4.16	8.25	9.43		0.2%		6.4	77%	68%	3.0	0.1%		6.4	78%	68%	3.0	0.1%		6.4	78%	68%	3.0
Blackstone Valley South	Crossman St #111	(J1 & J3)	13.8	4.16	8.26	9.44		0.2%		3.2	39%	34%	6.2	0.1%		3.2	39%	34%	6.2	0.1%		3.2	39%	34%	6.2
Blackstone Valley South	Daggett Ave #113	(J1 & J2)	13.8	4.16	4.23	5.02		0.2%		2.2	51%	43%	2.8	0.1%		2.2	52%	43%	2.8	0.1%		2.2	52%	43%	2.8
Blackstone Valley South	Front #24	J1	13.8	4.16	3.1	3.1		0.2%		1.2	37%	37%	1.9	0.1%		1.2	37%	37%	1.9	0.1%		1.2	37%	37%	1.9
Blackstone Valley South	Hyde Avenue #28	(J1 & J2)	13.8	4.16	5.25	5.25		0.2%		2.0	39%	39%	3.2	0.1%		2.0	39%	39%	3.2	0.1%		2.0	39%	39%	3.2
Blackstone Valley South	Lee St. #30	(J1, J3, J5)	13.8	4.16	7	7		0.2%		5.0	71%	71%	2.0	0.1%		5.0	71%	71%	2.0	0.1%		5.0	71%	71%	2.0
Blackstone Valley South	Pawtucket No.1 #107	T71	115	13.8	48	48		0.2%		27.5	57%	57%	20.5	0.1%		27.5	57%	57%	20.5	0.1%		27.5	57%	57%	20.5
Blackstone Valley South	Pawtucket No.1 #107	T73A	115	13.8	48	48		0.2%		40.9	85%	85%	7.1	0.1%		40.9	85%	85%	7.1	0.1%		41.0	85%	85%	7.0
Blackstone Valley South	Pawtucket No.1 #107	T74	115	13.8	48	48		0.2%		30.0	63%	63%	18.0	0.1%		30.1	63%	63%	17.9	0.1%		30.1	63%	63%	17.9
Blackstone Valley South	Pawtucket No.2 #148	T1	13.8	4.16	7.6	9.36		0.2%		2.1	27%	22%	7.3	0.1%		2.1	27%	22%	7.3	0.1%		2.1	27%	22%	7.3
Blackstone Valley South	Pawtucket No.2 #148	T2	13.8	4.16	7.6	9.36		0.2%		3.2	42%	34%	6.2	0.1%		3.2	42%	34%	6.2	0.1%		3.2	42%	34%	6.2
Blackstone Valley South	Southeast #60		13.8	4.16	7	7		0.2%		2.4	34%	34%	4.6	0.1%		2.4	34%	34%	4.6	0.1%		2.4	34%	34%	4.6
Blackstone Valley South	Valley #102	T21	115	13.8	38.36	45.95		0.2%		23.4	61%	51%	22.5	0.1%		23.4	61%	51%	22.5	0.1%		23.5	61%	51%	22.5
Blackstone Valley South	Valley #102	T22	115	13.8	31.6	40.29		0.2%		20.0	63%	50%	20.3	0.1%		20.0	63%	50%	20.3	0.1%		20.0	63%	50%	20.3
Blackstone Valley South	Valley #102	T23	115	24	42.01	51.51		0.2%		3.9	9%	8%	47.6	0.1%		3.9	9%	8%	47.6	0.1%		3.9	9%	8%	47.6
Blackstone Valley South	Washington #126	T261	115	13.8	48	48		0.2%		26.0	54%	54%	22.0	0.1%		26.0	54%	54%	22.0	0.1%		26.0	54%	54%	22.0
Blackstone Valley South	Washington #126	T262	115	13.8	59.27	57.4		0.2%		25.2	43%	44%	32.2	0.1%		25.3	43%	44%	32.1	0.1%		25.3	43%	44%	32.1
Central RI East	APPONAUG 3	3	23	12.47	15.5	19.6		2.2%		9.8	63%	50%	9.8	2.0%		10.0	65%	51%	9.6	1.9%		10.2	66%	52%	9.4
Central RI East	APPONAUG 3	4	23	12.47	11.9	12.6		2.2%		9.5	80%	75%	3.1	2.0%		9.7	81%	77%	2.9	1.9%		9.9	83%	78%	2.7
Central RI East	AUBURN 73	1	23	4.16	10.6	11.8		2.2%		5.8	55%	49%	6.0	2.0%		5.9	56%	50%	5.9	1.9%		6.0	57%	51%	5.8
Central RI East	AUBURN 73	2	23	4.16	9.7	10.6		2.2%		3.9	40%	36%	6.8	2.0%		3.9	41%	37%	6.7	1.9%		4.0	42%	38%	6.6
Central RI East	DRUMROCK 14	3	115	23/12.47	53.0	76.0		2.2%		36.2	68%	48%	39.8	2.0%		36.9	70%	49%	39.1	1.9%		37.6	71%	49%	38.4
Central RI East	DRUMROCK 14	4	115	23	89.0	107.4		2.2%		48.9	55%	46%	58.5	2.0%		49.9	56%	46%	57.5	1.9%		50.8	57%	47%	56.6
Central RI East	DRUMROCK 14	5	115	23/12.47	107.0	107.0		2.2%		68.2	64%	64%	38.8	2.0%		69.6	65%	65%	37.4	1.9%		70.9	66%	66%	36.1
Central RI East	KILVERT STREET 86	1	115	12.47	67.0	84.0	Expected In-Service 2015	2.2%		26.9	40%	32%	57.1	2.0%		27.5	41%	33%	56.5	1.9%		28.0	42%	33%	56.0
Central RI East	KILVERT STREET 87	2	115	12.47	67.0	84.0		2.2%		20.3	30%	24%	63.7	2.0%		20.7	31%	25%	63.3	1.9%		21.1	31%	25%	62.9
Central RI East	LAKEWOOD 57	1	23	4.16	10.1	10.6		2.2%		7.3	72%	68%	3.4	2.0%		7.4	73%	70%	3.2	1.9%		7.6	75%	71%	3.1
Central RI East	LAKEWOOD 57	2	23	4.16	10.2	11.5		2.2%		2.2	22%	19%	9.2	2.0%		2.3	22%	20%	9.2	1.9%		2.3	23%	20%	9.1
Central RI East	LINCOLN AVENUE 72	1	115	12.47	52.1	54.9		2.2%		26.5	51%	48%	28.4	2.0%		27.0	52%	49%	27.9	1.9%		27.6	53%	50%	27.4
Central RI East	LINCOLN AVENUE 72	2	115	12.47	52.1	54.9		2.2%		29.0	56%	53%	26.0	2.0%		29.5	57%	54%	25.4	1.9%		30.1	58%	55%	24.8
Central RI East	PAWTUXET 31	1	23	4.16	4.3	5.1	Planned retire 2015																		
Central RI East	PONTIAC 27	1	115	12.47	50.7	53.3		2.2%		24.7	49%	46%	28.6	2.0%		25.2	50%	47%	28.1	1.9%		25.7	51%	48%	27.6
Central RI East	PONTIAC 27	2	115	12.47	46.5	51.9		2.2%		30.7	66%	59%	21.1	2.0%		31.4	67%	60%	20.5	1.9%		32.0	69%	62%	19.9
Central RI East	SOCKANOSSET 24	1	115	23	50.3	56.8		2.2%		32.7	65%	58%	24.1	2.0%		33.3	66%	59%	23.5	1.9%		34.0	68%	60%	22.8
Central RI East	SOCKANOSSET 24	2	115	23	50.4	57.0		2.2%		29.8	59%	52%	27.2	2.0%		30.4	60%	53%	26.6	1.9%		31.0	62%	54%	26.0
Central RI East	WARWICK 52	1	23	12.47	11.6	12.7		1.0%		8.6	74%	68%	4.1	0.7%		8.7	75%	68%	4.0	0.6%		8.7	75%	69%	4.0
Central RI East	WARWICK 52	4	23	12.47	12.0	12.0		1.0%		9.1	76%	76%	2.9	0.7%		9.2	76%	76%	2.8	0.6%		9.2	77%	77%	2.8
Central RI West	ANTHONY	1	23	12.47	7.8	8.1		1.0%		5.1	66%	63%	3.0	0.7%		5.2	66%	64%	2.9	0.6%		5.2	67%	64%	2.9
Central RI West	ANTHONY	2	23	12.47	7.8	8.1		1.0%		4.8	61%	59%	3.3	0.7%		4.8	62%	59%	3.3	0.6%		4.8	62%	59%	3.3
Central RI West	ARCTIC	1	23	4.16	5.0	5.0		1.0%		3.4	68%	68%	1.6	0.7%		3.4	69%	68%	1.6	0.6%		3.5	69%	70%	1.5
Central RI West	ARCTIC	2	23	4.16	6.7	7.4		1.0%		0.3	4%	4%	7.1	0.7%		0.3	4%	4%	7.1	0.6%		0.3	4%	4%	7.1
Central RI West	COVENTRY	1	23	12.47	11.4	13.5		1.0%		10.2	89%	76%	3.3	0.7%		10.3	90%	76%	3.2	0.6%		10.3	91%	76%	3.2
Central RI West	COVENTRY MITS	1	34.5	12.47	13.0	14.0	In-Service 2013	1.0%		9.9	76%	71%	4.1	0.7%		10.0	77%	71%	4.0	0.6%		10.1	77%	72%	3.9
Central RI West	DIVISION ST	1	34.5	12.47	23.7	27.6		1.0%		16.1	68%	58%	11.5	0.7%		16.2	68%	59%	11.4	0.6%		16.3	69%	59%	11.3
Central RI West	DIVISION ST	2	34.5	12.47	23.7	27.6		1.0%		10.4	44%	38%	17.2	0.7%		10.5	44%	38%	17.1	0.6%		10.6	45%	38%	17.0
Central RI West	HOPE	1	23	12.47	7.5	8.5		1.0%		4.8	64%	56%	3.7	0.7%		4.9	65%	58%	3.6	0.6%		4.9	65%	58%	3.6
Central RI West	HOPE	2*	23	12.47	13.7	16.5		1.0%		8.5	62%	52%	8.0	0.7%		8.6	63%	52%	7.9	0.6%		8.6	63%	52%	7.9
Central RI West	HOPKINS HILL	1*	34.5	12.47	48.8	51.0		1.0%		21.2	44%	42%	29.8	0.7%		21.4	44%	42%	29.6	0.6%		21.5	44%	42%	29.5
Central RI West	HOPKINS HILL	2*	34.5	12.47	49.2	52.0		1.0%		30.9	63%	59%	21.1	0.7%		31.1	63%	60%	20.9	0.6%		31.3	64%	60%	20.7
Central RI West	HUNT RIVER	2	34.5	12.47	11.2	12.7	Planned retire 2017 - Flood Mitigation																		
Central RI West	KENT COUNTY	5	115	12.47	50.0	58.0	Expected In-Service 2017			27.4	55%	47%	30.6	0.7%		27.6	55%	48%	30.4	0.6%		27.8	56%	48%	30.2
Central RI West	KENT COUNTY	6	115	12.47	50.7	58.9		1.0%		16.2	32%	28%	42.7	0.7%		16.3	32%	28%	42.6	0.6%		16.4	32%	28%	42.5
Central RI West	KENT COUNTY	1*	115	34.5	57.3	67.6		1.0%		35.9	63%	53%	31.7	0.7%		36.1	63%	53%	31.5	0.6%		36.4	64%	54%	31.2
Central RI West	KENT COUNTY	2*	115	34.5	66.3	69.9		1.0%		37.4	56%	54%	32.5	0.7%		37.7	57%	54%	32.2	0.6%		37.9	57%	54%	32.0
Central RI West	KENT COUNTY	7*	115	34.5	57.3	68.8		1.0%		35.1	61%	51%	33.7	0.7%		35.3	62%	51%	33.5	0.6%		35.5	62%	52%	33.3
Central RI West	NATICK	1	23	12.47	13.2	14.3		1.0%		8.5	64%	59%	5.8	0.7%		8.6	65%	60%	5.7	0.6%		8.6	65%	60%	5.7
Central RI West	NATICK	2	23	12.47	13.5	14.5		1.0%		7.0	52%	48%	7.5	0.7%		7.0	52%	48%	7.5	0.6%		7.1	52%	49%	7.4
Central RI West	WARWICK MALL	1	23	12.47	8.8	8.9		1.0%		4.5	52%	51%	4.4	0.7%		4.6	52%	52%	4.3	0.6%		4.6	52%	52%	4.3
Central RI West	WARWICK MALL	2	23	12.47	8.7	9.1		1.0%		3.0	35%	33%	6.1	0.7%		3.1	35%	34%	6.0	0.6%		3.1	35%	34%	6.0

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			System Voltage (kV)		Rating (MVA)			2017						2018						2019					
Study Area	Substation	Tranf. ID.	From	To	SN	SE	Comments	Growth	Spot	MVA	% SN	% SE	N-1 Capacity	Growth	Spot	MVA	% SN	% SE	N-1 Capacity	Growth	Spot	MVA	% SN	% SE	N-1 Capacity
Central RI West	NEW LONDON AVE	1	115	12.47	55.0	60.0	Expected In-Service 2015	1.0%		27.0	49%	45%	33.0	0.7%		27.2	49%	45%	32.8	0.6%		27.4	50%	46%	32.6
East Bay	BARRINGTON 4	1	23	12.47	35.19	35.09		0.6%		20.7	59%	59%	14.4	0.4%		20.8	59%	59%	14.3	0.2%		20.8	59%	59%	14.3
East Bay	BRISTOL 51	1	115	12.47	56.9	63.4		0.6%		19.7	35%	31%	43.7	0.4%		19.7	35%	31%	43.7	0.2%		19.8	35%	31%	43.6
East Bay	BRISTOL 51	2	23	12.47	25.1	29.8		0.6%		10.0	40%	33%	19.8	0.4%		10.0	40%	34%	19.8	0.2%		10.0	40%	34%	19.8
East Bay	KENT CORNERS 47	T1	23	4.16	7.14	7.53		0.6%		2.8	40%	38%	4.7	0.4%		2.9	40%	38%	4.7	0.2%		2.9	40%	38%	4.7
East Bay	KENT CORNERS 47	T2	23	4.16	6.82	8.07		0.6%		4.6	68%	57%	3.4	0.4%		4.6	68%	57%	3.4	0.2%		4.6	68%	58%	3.4
East Bay	PHILLIPSDALE 20	T1	115	23	56	56		0.6%		11.1	20%	20%	44.9	0.4%		11.2	20%	20%	44.8	0.2%		11.2	20%	20%	44.8
East Bay	PHILLIPSDALE 20	T2	115	23	45.32	56.75		0.6%		8.3	18%	15%	48.4	0.4%		8.4	18%	15%	48.4	0.2%		8.4	19%	15%	48.4
East Bay	PHILLIPSDALE 20	T3	23	12.47	25.16	28.87		0.6%		13.2	53%	46%	15.7	0.4%		13.2	53%	46%	15.6	0.2%		13.3	53%	46%	15.6
East Bay	WAMPANOAG 48	T1	115	12.47	42.83	52.72		0.6%		30.1	70%	57%	22.6	0.4%		30.2	71%	57%	22.5	0.2%		30.3	71%	57%	22.5
East Bay	WAMPANOAG 48	T2	115	12.47	52.36	55.33		0.6%		27.4	52%	50%	27.9	0.4%		27.5	52%	50%	27.8	0.2%		27.5	53%	50%	27.8
East Bay	WARREN 5	5	115	23	60.96	65.05		0.6%		8.5	14%	13%	56.6	0.4%		8.5	14%	13%	56.6	0.2%		8.5	14%	13%	56.5
East Bay	WARREN 5	6	115	23	59.6	64.17		0.6%		22.0	37%	34%	42.2	0.4%		22.0	37%	34%	42.1	0.2%		22.1	37%	34%	42.1
East Bay	WARREN 5	T1	115	12.47	48.28	53.43		0.6%		14.7	30%	27%	38.8	0.4%		14.7	30%	27%	38.7	0.2%		14.7	30%	28%	38.7
East Bay	WARREN 5	T2	115	12.47	50.62	59.57		0.6%		18.4	36%	31%	41.2	0.4%		18.4	36%	31%	41.1	0.2%		18.5	36%	31%	41.1
East Bay	WATERMAN AVENUE 78	T1	23	12.47	16.36	18.26		0.6%		7.6	46%	42%	10.7	0.4%		7.6	46%	42%	10.7	0.2%		7.6	47%	42%	10.6
East Bay	WATERMAN AVENUE 78	T2	23	12.47	16.36	18.26		0.6%		6.3	39%	35%	11.9	0.4%		6.3	39%	35%	11.9	0.2%		6.4	39%	35%	11.9
Newport	Bailey Brook	191	23	4.16	8.3	8.7	Planned retire 2015 (Newport related)																		
Newport	Bailey Brook	192	23	4.16	8.6	10.4	Planned retire 2015 (Newport related)																		
Newport	Clarke St	651	23	4.16	4.1	4.3	Planned Upgrade 2015	1.9%		3.3	82%	77%	1.0	1.7%		3.4	83%	79%	0.9	1.6%		3.4	84%	79%	0.9
Newport	Clarke St	652	23	4.16	4.5	5.0		1.9%		3.0	67%	60%	2.0	1.7%		3.1	68%	62%	1.9	1.6%		3.1	70%	62%	1.9
Newport	Dexter	361	115	69	121.0	130.0		1.9%		79.2	65%	61%	50.8	1.7%		80.5	67%	62%	49.5	1.6%		81.8	68%	63%	48.2
Newport	Dexter	362	115	69	61.0	65.0		1.9%		34.1	56%	52%	30.9	1.7%		34.7	57%	53%	30.3	1.6%		35.2	58%	54%	29.8
Newport	Dexter	363	115	69	61.0	65.0		1.9%		34.1	56%	52%	30.9	1.7%		34.7	57%	53%	30.3	1.6%		35.2	58%	54%	29.8
Newport	Dexter	364	115	13.8	44.6	47.4		1.9%		28.9	65%	61%	18.5	1.7%		29.4	66%	62%	18.0	1.6%		29.9	67%	63%	17.5
Newport	Eldred	451	23	4.16	7.9	9.6	Planned retire 2015																		
Newport	Eldred NEW	1	23	4.16	5.8	7.0	Expected in-service 2015	1.9%		2.9	49%	41%	4.1	1.7%		2.9	50%	41%	4.1	1.6%		2.9	51%	41%	4.1
Newport	Eldred NEW	2	23	4.16	5.8	7.0	Expected in-service 2015	1.9%		2.2	38%	31%	4.8	1.7%		2.2	38%	31%	4.8	1.6%		2.3	39%	33%	4.7
Newport	Gate 2	381	69	23	54.2	63.7		1.9%		18.0	33%	28%	45.7	1.7%		18.3	34%	29%	45.4	1.6%		18.6	34%	29%	45.1
Newport	Gate 2	382	69	23	55.0	60.0	Expected in-service 2015	1.9%		18.0	33%	30%	42.0	1.7%		18.3	33%	31%	41.7	1.6%		18.6	34%	31%	41.4
Newport	Gate 2	731	23	4.16	8.1	8.7	Planned retire 2015 (Newport related)																		
Newport	Harrison	321	23	4.16	8.3	9.7		1.9%		2.9	35%	30%	6.8	1.7%		3.0	35%	31%	6.7	1.6%		3.0	36%	31%	6.7
Newport	Harrison	322	23	4.16	8.1	10.1		1.9%		5.3	66%	52%	4.8	1.7%		5.4	67%	53%	4.7	1.6%		5.5	68%	54%	4.6
Newport	Hospital	461	23	4.16	4.1	4.3		1.9%		2.7	67%	63%	1.6	1.7%		2.8	68%	65%	1.5	1.6%		2.8	69%	65%	1.5
Newport	Hospital	462	23	4.16	4.1	4.3		1.9%		2.2	54%	51%	2.1	1.7%		2.2	55%	51%	2.1	1.6%		2.3	56%	53%	2.0
Newport	Jepson	341	23	4.16	9.7	10.4	Planned retire 2015 (Newport related)																		
Newport	Jepson	371	69	23	16.5	18.5		1.9%		5.8	35%	31%	12.7	1.7%		5.9	36%	32%	12.6	1.6%		6.0	36%	32%	12.5
Newport	Jepson	372	69	23	23.2	24.8		1.9%		10.6	46%	43%	14.2	1.7%		10.7	46%	43%	14.1	1.6%		10.9	47%	44%	13.9
Newport	Jepson	373	69	23	48.9	57.9		1.9%		22.8	47%	39%	35.1	1.7%		23.1	47%	40%	34.8	1.6%		23.5	48%	41%	34.4
Newport	Jepson	374	69	13.8	42.9	48.6		1.9%		23.4	55%	48%	25.2	1.7%		23.8	56%	49%	24.8	1.6%		24.2	56%	50%	24.4
Newport	Jepson	376	69	23	15.4	16.4		1.9%		6.5	42%	40%	9.9	1.7%		6.6	43%	40%	9.8	1.6%		6.7	44%	41%	9.7
Newport	Kingston	311	23	4.16	7.9	9.6		1.9%		5.2	66%	54%	4.4	1.7%		5.3	68%	55%	4.3	1.6%		5.4	69%	56%	4.2
Newport	Kingston	312	23	4.16	7.9	9.6		1.9%		4.2	53%	44%	5.4	1.7%		4.3	54%	45%	5.3	1.6%		4.4	55%	46%	5.2
Newport	Merton	511	23	4.16	2.2	2.4		1.9%		2.0	89%	83%	0.4	1.7%		2.0	90%	83%	0.4	1.6%		2.1	92%	88%	0.3
Newport	Merton	512	23	4.16	8.4	10.0		1.9%		5.1	61%	51%	4.9	1.7%		5.2	62%	52%	4.8	1.6%		5.3	63%	53%	4.7
Newport	Newport Sub	1	69	13.8	55.0	60.0	Expected in-service 2015	1.9%		18.9	34%	32%	41.1	1.7%		19.2	35%	32%	40.8	1.6%		19.5	35%	33%	40.5
Newport	Newport Sub	2	69	13.8	55.0	60.0	Expected in-service 2015	1.9%		17.6	32%	29%	42.4	1.7%		17.9	33%	30%	42.1	1.6%		18.2	33%	30%	41.8
Newport	No. Aquidneck	211	23	4.16	8.0	10.2		1.9%		3.7	46%	36%	6.5	1.7%		3.8	47%	37%	6.4	1.6%		3.8	48%	37%	6.4
Newport	So. Aquidneck	221	23	4.16	7.9	9.6		1.9%		4.7	60%	49%	4.9	1.7%		4.8	61%	50%	4.8	1.6%		4.9	62%	51%	4.7
Newport	Vernon Ave	231	23	4.16	3.6	3.9	Planned retire 2015 (Newport related)																		
Newport	Vernon Ave	232	23	4.16	3.6	3.9	Planned retire 2015 (Newport related)																		
Newport	West Howard	541	23	4.16	12.6	14.8		1.9%		8.6	68%	58%	6.2	1.7%		8.7	69%	59%	6.1	1.6%		8.9	70%	60%	5.9
Newport	West Howard	542	23	4.16	13.1	13.58		1.9%		6.1	47%	45%	7.5	1.7%		6.2	48%	46%	7.4	1.6%		6.3	48%	46%	7.3
North Central RI	Centerdale #50	T1	23	4.16	7.1	7.54		2.2%		3.4	48%	45%	4.1	2.0%		3.5	49%	46%	4.1	1.9%		3.6	50%	47%	4.0
North Central RI	Centerdale #50	T3	23	12.47	7.93	8.34		2.2%		5.6	71%	68%	2.7	2.0%		5.7	73%	69%	2.6	1.9%		5.9	74%	70%	2.5
North Central RI	Chopmist #34	T1	23	12.47	15.96	16.42		2.2%		9.7	61%	59%	6.7	2.0%		9.9	62%	60%	6.5	1.9%		10.1	63%	61%	6.4
North Central RI	Chopmist #34	T2	23	12.47	13.84	13.57		2.2%		7.8	57%	58%	5.7	2.0%		8.0	58%	59%	5.6	1.9%		8.2	59%	60%	5.4
North Central RI	Chopmist #34	T3	23	12.47	12.81	13.94		2.2%		7.0	54%	50%	7.0	2.0%		7.1	55%	51%	6.8	1.9%		7.2	56%	52%	6.7
North Central RI	Farnum Pike #23	T1	115	12.47	64.8	64.8		2.2%		19.8	31%	31%	45.0	2.0%		20.2	31%	31%	44.6	1.9%		20.6	32%	32%	44.2
North Central RI	Farnum Pike #23	T2	115	12.47	64.8	64.8		2.2%		27.1	42%	42%	37.7	2.0%		27.6	43%	43%	37.2	1.9%		28.2	43%	43%	36.6
North Central RI	Johnston #18	T1	115	12.47	25	35		2.2%		17.4	70%	50%	17.6	2.0%		14.6	58%	42%	20.4	1.9%		14.8	59%	42%	20.2
North Central RI	Johnston #18	T1 - 23	115	23	63.4	77		2.2%		24.0	38%	31%	53.0	2.0%		24.5	39%	32%	52.5	1.9%		24.9	39%	32%	52.1
North Central RI	Johnston #18	T3	115	12.47	53.68	56.33		2.2%		27.9	52%	49%	28.5	2.0%		28.4	53%	50%	27.9	1.9%		28.9	54%	51%	27.4
North Central RI	Johnston #18	T4	115	12.47	68.6	74		2.2%		31.3	46%	42%	42.7	2.0%		25.5	37%	35%	48.5	1.9%		26.0	38%	35%	48.0
North Central RI	Johnston #18	T2- 23	115	23	80	90		2.2%		39.2	49%	44%	50.8	2.0%		40.0	50%	44%	50.0	1.9%		40.8	51%	45%	49.2
North Central RI	Manton #69	T2	23	12.47	25.46	26.66		2.2%		18.2	71%	68%	8.5	2.0%		18.6	73%	70%	8.1	1.9%		18.9	74%	71%	7.8
North Central RI	Putnam Pike #38	T1	115	12.47	64.94	68.79		2.2%		30.7	47%	45%	38.1	2.0%		30.1	46%	44%	38.7	1.9%		30.7	47%	45%	38.1
North Central RI	Putnam Pike #38	T2	115	12.47	64.94	68.79		2.2%		22.2	34%	32%	46.6	2.0%		22.6	35%	33%	46.2	1.9%		23.0	35%	34%	45.7
North Central RI	Shun Pike #35	T1	115	12.47	68.6	74	Expected in-service 2018							2.0%		12.0	18%	16%	62.0	1.9%		12.3	18%	17%	61.7
North Central RI	Shun Pike SIMS	T3	115	13.2	27	30	Expected in-service 2014	2.2%		11.8	44%	39%	18.2	2.0%		12.0	45%	40%	18.0	1.9%		12.2	45%	41%	17.8
North Central RI	West Cranston #21	T1	115	12.47	27.78	29.91		2.2%		10.0	36%	33%	19.9	2.0%		9.0	32%	30%	20.9	1.9%		9.1	33%	31%	20.8
North Central RI	West Cranston #21	T2	115	12.47	27.76	29.86		2.2%		20.5	74%	69%	9.4	2.0%		20.9	75%	70%	9.0	1.9%		21.3	77%	71%	8.6
North Central RI	West Greenville # 45	T3	23	12.47	11.91	13.56		2.2%		3.0	25%	22%	10.5	2.0%		3.1	26%	23%	10.5	1.9%		3.1	26%	23%	10.4
North Central RI	Wolf Hill #19	T1	115	23	65.01	69.83		2.2%		31.1	48%	45%	38.7	2.0%		31.8	49%	45%	38.1	1.9%		32.4	50%	46%	37.5
Providence	Admiral Street #9	T1	23	11/4.16	15	15		0.4%		2.8	19%	19%	12.2	0.2%		2.8	19%	19%	12.2	0.2%		2.8	19%	19%	12.2
Providence	Admiral Street #9	T2	23	11/4.16	15	15		0.4%		3.6	24%	24%	11.4	0.2%		3.6	24%	24%	11.4	0.2%		3.6	24%	24%	11.4
Providence	Admiral Street #9	T3	115	23	62.1	63.7		0.4%		23.2	37%	36%	40.5	0.2%		23.3	38%	37%	40.4	0.2%		23.3	38%	37%	40.4

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			System Voltage (kV)		Rating (MVA)			2017						2018						2019					
Study Area	Substation	Tranf. ID.	From	To	SN	SE	Comments	Growth	Spot	MVA	% SN	% SE	N-1 Capacity	Growth	Spot	MVA	% SN	% SE	N-1 Capacity	Growth	Spot	MVA	% SN	% SE	N-1 Capacity
Providence	Admiral Street #9	T4	115	23	63	64.9		0.4%		22.7	36%	35%	42.2	0.2%		22.7	36%	35%	42.2	0.2%		22.8	36%	35%	42.1
Providence	Admiral Street #9	T5	23	4.16	15.13	15.36		0.4%		6.0	40%	39%	9.3	0.2%		6.0	40%	39%	9.3	0.2%		6.1	40%	39%	9.3
Providence	Clarkson Street #13	T1	115	12.47	65.46	81.01		0.4%		36.9	56%	46%	44.1	0.2%		37.0	56%	46%	44.1	0.2%		37.0	57%	46%	44.0
Providence	Clarkson Street #13	T2	115	12.47	65.16	80.24		0.4%		35.3	54%	44%	45.0	0.2%		35.4	54%	44%	44.9	0.2%		35.4	54%	44%	44.8
Providence	Dyer St #2	T1	11.5	4.16	18.27	19.78		0.4%		8.1	44%	41%	11.7	0.2%		8.1	44%	41%	11.7	0.2%		8.1	45%	41%	11.6
Providence	Dyer St #2	T2	11.5	4.16	18.25	19.74		0.4%		5.4	29%	27%	14.4	0.2%		5.4	30%	27%	14.3	0.2%		5.4	30%	27%	14.3
Providence	East George St. #77	T1	23	4.16	12.59	15.27		0.4%		4.4	35%	29%	10.8	0.2%		4.4	35%	29%	10.8	0.2%		4.4	35%	29%	10.8
Providence	East George St. #77	T2	23	4.16	12.59	15.27		0.4%		4.8	38%	31%	10.5	0.2%		4.8	38%	31%	10.5	0.2%		4.8	38%	32%	10.5
Providence	Elmwood #7 (12.47 kV)	T2	23	12.47	40.58	45.78		0.4%		30.3	75%	66%	15.5	0.2%		30.4	75%	66%	15.4	0.2%		30.4	75%	66%	15.3
Providence	Franklin Square #11	2207	11.5	23	16.06	18.75		0.4%		7.2	45%	38%	11.6	0.2%		7.2	45%	38%	11.5	0.2%		7.2	45%	39%	11.5
Providence	Franklin Square #11	2210	11.5	23	17.14	15.85		0.4%		10.7	63%	68%	5.1	0.2%		10.8	63%	68%	5.1	0.2%		10.8	63%	68%	5.1
Providence	Franklin Square #11	2220	11.5	23	17.7	19.3		0.4%		15.5	88%	80%	3.8	0.2%		15.5	88%	80%	3.8	0.2%		15.6	88%	81%	3.7
Providence	Franklin Square #11	2260	11.5	23	16.06	18.75		0.4%		5.2	32%	28%	13.5	0.2%		5.2	32%	28%	13.5	0.2%		5.2	33%	28%	13.5
Providence	Franklin Square #11	3320	11.5	34.5	25.87	29.66		0.4%		7.7	30%	26%	21.9	0.2%		7.8	30%	26%	21.9	0.2%		7.8	30%	26%	21.9
Providence	Franklin Square #11	3324	11.5	34.5	25.75	29.5		0.4%		10.0	39%	34%	19.5	0.2%		10.0	39%	34%	19.5	0.2%		10.0	39%	34%	19.5
Providence	Franklin Square #11	T1	115	11.5	50.65	61.04		0.4%		23.2	46%	38%	37.8	0.2%		23.3	46%	38%	37.8	0.2%		23.3	46%	38%	37.7
Providence	Franklin Square #11	T2	115	11.5	51.24	56.69		0.4%		16.6	32%	29%	40.1	0.2%		16.6	32%	29%	40.1	0.2%		16.7	33%	29%	40.0
Providence	Franklin Square #11	T3	115	11.5	51.24	56.69		0.4%		28.8	56%	51%	27.9	0.2%		28.8	56%	51%	27.9	0.2%		28.9	56%	51%	27.8
Providence	Geneva #71	T1	23	4.16	11.54	14.19		0.4%		8.5	73%	60%	5.7	0.2%		8.5	73%	60%	5.7	0.2%		8.5	74%	60%	5.7
Providence	Harris Avenue #12	T1	23	4.16	11.48	12.72		0.4%		4.7	41%	37%	8.0	0.2%		4.7	41%	37%	8.0	0.2%		4.7	41%	37%	8.0
Providence	Harris Avenue #12	T2	23	4.16	9.06	11.52		0.4%		2.5	27%	21%	9.1	0.2%		2.5	27%	21%	9.1	0.2%		2.5	27%	21%	9.1
Providence	Huntington Park #67	T1	23	4.16	3	3		0.4%		2.0	66%	66%	1.0	0.2%		2.0	66%	66%	1.0	0.2%		2.0	66%	66%	1.0
Providence	Knightsville #66	T1	22.9	4.16	10.48	11.02		0.4%		6.6	63%	60%	4.4	0.2%		6.7	64%	60%	4.4	0.2%		6.7	64%	61%	4.4
Providence	Knightsville #66	T2	22.9	4.16	10.48	11.02		0.4%		4.6	44%	41%	6.5	0.2%		4.6	44%	41%	6.4	0.2%		4.6	44%	42%	6.4
Providence	Lippitt Hill #79	T1	22.9	12.47	25.11	27.54		0.4%		7.7	31%	28%	19.9	0.2%		7.7	31%	28%	19.8	0.2%		7.7	31%	28%	19.8
Providence	Lippitt Hill #79	T2	22.9	12.47	25.11	27.54		0.4%		8.9	35%	32%	18.6	0.2%		8.9	36%	32%	18.6	0.2%		8.9	36%	32%	18.6
Providence	Olneyville #6	T1	11.5	4.16	11.8	13.02		0.4%		4.9	41%	37%	8.2	0.2%		4.9	41%	37%	8.2	0.2%		4.9	41%	37%	8.1
Providence	Olneyville #6	T3	11.5	4.16	11.8	13.02		0.4%		3.3	28%	25%	9.7	0.2%		3.3	28%	25%	9.7	0.2%		3.3	28%	25%	9.7
Providence	Point Street #76	T1	115	12.47	77	89.8		0.4%		34.7	45%	39%	55.1	0.2%		34.7	45%	39%	55.1	0.2%		34.8	45%	39%	55.0
Providence	Point Street #76	T2	115	12.47	70.86	79.98		0.4%		36.0	51%	45%	44.0	0.2%		36.1	51%	45%	43.9	0.2%		36.2	51%	45%	43.8
Providence	Rochambeau Ave #37	T1	22.9	4.16	11.96	13.12		0.4%		5.3	44%	40%	7.8	0.2%		5.3	44%	40%	7.8	0.2%		5.3	44%	40%	7.8
Providence	Rochambeau Ave #37	T2	11.45	4.16	11.02	13.04		0.4%		3.6	32%	27%	9.5	0.2%		3.6	32%	27%	9.5	0.2%		3.6	32%	27%	9.5
Providence	South Street #1	24	11.5	23	9.1	10.23		0.4%		6.1	67%	60%	4.1	0.2%		6.1	67%	60%	4.1	0.2%		6.1	67%	60%	4.1
Providence	South Street #1	2201	11.5	23	9.1	10.23		0.4%		3.4	38%	34%	6.8	0.2%		3.4	38%	34%	6.8	0.2%		3.4	38%	34%	6.8
Providence	South Street #1	2216	11.5	23	10	10		0.4%		4.2	42%	42%	5.8	0.2%		4.2	42%	42%	5.8	0.2%		4.2	42%	42%	5.8
Providence	South Street #1	2248	11.5	23	12.81	14.33		0.4%		8.2	64%	57%	6.1	0.2%		8.2	64%	57%	6.1	0.2%		8.2	64%	57%	6.1
Providence	South Street #1	T1	115	11.5	66.34	78.75		0.4%		32.1	48%	41%	46.7	0.2%		32.2	48%	41%	46.6	0.2%		32.2	49%	41%	46.5
Providence	South Street #1	T2	115	11.5	66.78	77.14		0.4%		25.5	38%	33%	51.7	0.2%		25.5	38%	33%	51.6	0.2%		25.6	38%	33%	51.6
Providence	South Street #1	T3	115	11.5	72.69	91.22		0.4%		32.1	44%	35%	59.1	0.2%		32.2	44%	35%	59.1	0.2%		32.2	44%	35%	59.0
Providence	Sprague St. #36	T1	23	4.16	10.58	11.85		0.4%		2.8	26%	23%	9.1	0.2%		2.8	26%	23%	9.1	0.2%		2.8	26%	23%	9.1
Providence	Sprague St. #36	T2	23	4.16	10.79	12		0.4%		3.2	30%	27%	8.8	0.2%		3.2	30%	27%	8.8	0.2%		3.2	30%	27%	8.8
South County East	BONNET 42	2	34.5	12.47	11.3	12.2		2.2%		11.5	102%	94%	0.7	2.0%		11.8	104%	97%	0.4	1.9%		12.0	106%	98%	0.2
South County East	DAVISVILLE 84	1	115	34.5	45.3	52.1		2.2%		21.6	48%	41%	30.5	2.0%		22.0	49%	42%	30.1	1.9%		22.4	49%	43%	29.7
South County East	DAVISVILLE 84	2A	115	34.5	45.1	51.8		2.2%		26.2	58%	51%	25.6	2.0%		26.7	59%	52%	25.1	1.9%		27.2	60%	53%	24.6
South County East	LAFAYETTE 30	1	34.5	12.47	7.6	8.6		2.2%		6.1	80%	71%	2.5	2.0%		6.2	82%	72%	2.4	1.9%		6.3	83%	73%	2.3
South County East	LAFAYETTE 30	2	34.5	12.47	12.3	13.2		2.2%		10.5	85%	80%	2.7	2.0%		10.7	87%	81%	2.5	1.9%		10.9	89%	83%	2.3
South County East	OLD BAPTIST ROAD 46	1	115	12.47	48.7	54.4		2.2%		22.0	45%	40%	32.4	2.0%		22.4	46%	41%	32.0	1.9%		22.9	47%	42%	31.5
South County East	OLD BAPTIST ROAD 46	2	115	12.47	48.9	51.9		2.2%		22.4	46%	43%	29.5	2.0%		22.9	47%	44%	29.0	1.9%		23.3	48%	45%	28.6
South County East	PEACEDALE 59	1	34.5	12.47	24.2	27.2		2.2%		14.9	61%	55%	12.3	2.0%		15.2	63%	56%	12.0	1.9%		15.4	64%	57%	11.8
South County East	PEACEDALE 59	2	34.5	12.47	24.2	27.2		2.2%		12.0	49%	44%	15.2	2.0%		12.2	50%	45%	15.0	1.9%		12.4	51%	46%	14.8
South County East	QUONSET 83	1	34.5	12.47	25.6	26.7		2.2%		18.4	72%	69%	8.3	2.0%		18.7	73%	70%	8.0	1.9%		19.1	75%	72%	7.6
South County East	TOWER HILL 88	1	115	12.47	50.0	60.0		2.2%		39.9	80%	67%	20.1	2.0%		40.7	81%	68%	19.3	1.9%		41.5	83%	69%	18.5
South County East	WAKEFIELD 17	4	34.5	12.47	12.9	13.5		2.2%		9.6	75%	71%	3.9	2.0%		9.8	76%	73%	3.7	1.9%		10.0	77%	74%	3.5
South County East	WAKEFIELD 17	3T	34.5	12.47	12.9	13.5		2.2%		12.4	96%	92%	1.1	2.0%		12.7	98%	94%	0.8	1.9%		12.9	100%	96%	0.6
South County East	WAKEFIELD 17	5T	34.5	12.47	12.9	13.5		2.2%		11.5	89%	85%	2.0	2.0%		11.7	91%	87%	1.8	1.9%		12.0	93%	89%	1.5
South County East	WEST KINGSTON 62	1	115	34.5	43.9	55.7		2.2%		30.7	70%	55%	25.0	2.0%		31.2	71%	56%	24.5	1.9%		31.7	72%	57%	24.0
South County East	WEST KINGSTON 62	2	115	34.5	75.8	93.5		2.2%		45.3	60%	48%	48.2	2.0%		46.2	61%	49%	47.3	1.9%		47.1	62%	50%	46.4
South County West	ASHAWAY 43	1	34.5	12.47	8.4	9.1	Planned retire 2014 (Hopkinton related)																		
South County West	HOPE VALLEY 41	1	34.5	12.47	7.3	9.3	Planned retire 2014 (Hopkinton related)																		
South County West	HOPKINTON	1	115	12.47	50.0	55.0	Expected in-service 2014	2.2%		31.9	64%	58%	23.1	2.0%		32.5	65%	59%	22.5	1.9%		33.2	66%	60%	21.8
South County West	HOPKINTON	2	115	12.47	50.0	55.0	Expected in-service 2014	2.2%		27.7	55%	50%	27.3	2.0%		28.3	57%	51%	26.7	1.9%		28.8	58%	52%	26.2
South County West	KENYON 68	1	115	12.47	49.7	53.7		2.2%		24.3	49%	45%	29.4	2.0%		24.8	50%	46%	28.9	1.9%		25.3	51%	47%	28.4
South County West	KENYON 68	2	115	12.47	49.7	53.7		2.2%		19.2	39%	36%	34.5	2.0%		19.5	39%	36%	34.2	1.9%		19.9	40%	37%	33.8
South County West	LANGWORTHY 86	1	34.5	12.47	8.2	9.3	Planned retire 2014 (Hopkinton related)																		
South County West	LANGWORTHY 86	1	34.5	12.47	12.0	14.0	Expected in-service 2014	2.2%		10.7	89%	76%	3.3	2.0%		10.9	91%	78%	3.1	1.9%		11.2	93%	80%	2.8
South County West	WESTERLY 16	2	34.5	12.47	25.6	26.7	Planned retire 2014 (Hopkinton related)																		
South County West	WESTERLY 16	4	34.5	12.47	25.6	26.7	Planned retire 2014 (Hopkinton related)																		
South County West	WOOD RIVER 85	10	115	34.5	48.2	52.4		2.2%		3.8	8%	7%	48.6	2.0%		3.9	8%	7%	48.5	1.9%		3.9	8%	7%	48.5
South County West	WOOD RIVER 85	20	115	34.5	91.2	106.6		2.2%		16.7	18%	16%	89.9	2.0%		17.0	19%	16%	89.6	1.9%		17.3	19%	16%	89.3
Tiverton	TIVERTON 33	1	115	12.47	33.4	33.0				16.0	48%	49%	17.0			16.1	48%	49%	17.0			16.1	48%	49%	17.0
Tiverton	TIVERTON 33	2	115	12.47	49.4	53.7				17.7	36%	33%	36.0			17.7	36%	33%	36.0			17.8	36%	33%	36.0

Transformers - Normal Configuration Summary
2012 Annual Plan for Rhode Island

			System Voltage (kV)		Rating (MVA)			2020						2021						2022					
Study Area	Substation	Tranf. ID.	From	To	SN	SE	Comments	Growth	Spot	MVA	% SN	% SE	N-1 Capacity	Growth	Spot	MVA	% SN	% SE	N-1 Capacity	Growth	Spot	MVA	% SN	% SE	N-1 Capacity
Blackstone Valley North	Farnum #105	T1	115	23	37.3	37.3		0.1%		4.1	11%	11%	33.2	0.1%		4.1	11%	11%	33.2	0.1%		4.1	11%	11%	33.2
Blackstone Valley North	Highland Dr	T1	115	13.8	53	62	Estimated in-service 2014	0.1%		20.8	39%	34%	41.2	0.1%		20.8	39%	34%	41.2	0.1%		20.9	39%	34%	41.1
Blackstone Valley North	Highland Dr	T2	115	13.8	53	62	Estimated in-service 2014	0.1%		20.9	39%	34%	41.1	0.1%		20.9	40%	34%	41.1	0.1%		21.0	40%	34%	41.0
Blackstone Valley North	Nasonville #127	T271	115	13.8	47.8	47.8		0.1%		31.0	65%	65%	16.8	0.1%		31.0	65%	65%	16.8	0.1%		31.0	65%	65%	16.8
Blackstone Valley North	Riverside #108	T81	115	13.8	41.83	45.23		0.1%		21.2	51%	47%	24.0	0.1%		21.2	51%	47%	24.0	0.1%		21.2	51%	47%	24.0
Blackstone Valley North	Riverside #108	T82	115	13.8	49.62	58.74		0.1%		25.5	51%	43%	33.2	0.1%		25.6	52%	44%	33.2	0.1%		25.6	52%	44%	33.1
Blackstone Valley North	Staples #112	T124	115	13.8	47.8	47.8		0.1%		27.1	57%	57%	20.7	0.1%		27.1	57%	57%	20.7	0.1%		27.2	57%	57%	20.6
Blackstone Valley North	West Farnum	T1	115	13.8	20	20	Retire 2012																		
Blackstone Valley North	Woonsocket	T1	115	13.8	47.8	50	In-Service 2012	0.1%		26.0	54%	52%	24.0	0.1%		26.0	54%	52%	24.0	0.1%		26.1	55%	52%	23.9
Blackstone Valley South	Central Falls #104	North (J5 & J7)	13.8	4.16	3	3		0.1%		2.4	81%	81%	0.6	0.1%		2.4	81%	81%	0.6	0.1%		2.4	81%	81%	0.6
Blackstone Valley South	Central Falls #104	South (J1 & J3)	13.8	4.16	3.12	3.12		0.1%		1.5	47%	47%	1.6	0.1%		1.5	47%	47%	1.6	0.1%		1.5	47%	47%	1.6
Blackstone Valley South	Centre Street #106	(J1, J3, J7)	13.8	4.16	3.1	3.1		0.1%		2.5	79%	79%	0.6	0.1%		2.5	79%	79%	0.6	0.1%		2.5	80%	80%	0.6
Blackstone Valley South	Cottage St #109	(J1, J3, J5)	13.8	4.16	8.25	9.43		0.1%		6.4	78%	68%	3.0	0.1%		6.4	78%	68%	3.0	0.1%		6.4	78%	68%	3.0
Blackstone Valley South	Crossman St #111	(J1 & J3)	13.8	4.16	8.26	9.44		0.1%		3.2	39%	34%	6.2	0.1%		3.2	39%	34%	6.2	0.1%		3.2	39%	34%	6.2
Blackstone Valley South	Daggett Ave #113	(J1 & J2)	13.8	4.16	4.23	5.02		0.1%		2.2	52%	43%	2.8	0.1%		2.2	52%	44%	2.8	0.1%		2.2	52%	44%	2.8
Blackstone Valley South	Front #24	J1	13.8	4.16	3.1	3.1		0.1%		1.2	37%	37%	1.9	0.1%		1.2	37%	37%	1.9	0.1%		1.2	37%	37%	1.9
Blackstone Valley South	Hyde Avenue #28	(J1 & J2)	13.8	4.16	5.25	5.25		0.1%		2.0	39%	39%	3.2	0.1%		2.0	39%	39%	3.2	0.1%		2.0	39%	39%	3.2
Blackstone Valley South	Lee St. #30	(J1, J3, J5)	13.8	4.16	7	7		0.1%		5.0	71%	71%	2.0	0.1%		5.0	71%	71%	2.0	0.1%		5.0	71%	71%	2.0
Blackstone Valley South	Pawtucket No.1 #107	T71	115	13.8	48	48		0.1%		27.6	57%	57%	20.4	0.1%		27.6	57%	57%	20.4	0.1%		27.6	58%	58%	20.4
Blackstone Valley South	Pawtucket No.1 #107	T73A	115	13.8	48	48		0.1%		41.0	85%	85%	7.0	0.1%		41.0	86%	86%	7.0	0.1%		41.1	86%	86%	6.9
Blackstone Valley South	Pawtucket No.1 #107	T74	115	13.8	48	48		0.1%		30.1	63%	63%	17.9	0.1%		30.1	63%	63%	17.9	0.1%		30.2	63%	63%	17.8
Blackstone Valley South	Pawtucket No.2 #148	T1	13.8	4.16	7.6	9.36		0.1%		2.1	27%	22%	7.3	0.1%		2.1	27%	22%	7.3	0.1%		2.1	27%	22%	7.3
Blackstone Valley South	Pawtucket No.2 #148	T2	13.8	4.16	7.6	9.36		0.1%		3.2	42%	34%	6.2	0.1%		3.2	42%	34%	6.2	0.1%		3.2	42%	34%	6.2
Blackstone Valley South	Southeast #60		13.8	4.16	7	7		0.1%		2.4	34%	34%	4.6	0.1%		2.4	34%	34%	4.6	0.1%		2.4	34%	34%	4.6
Blackstone Valley South	Valley #102	T21	115	13.8	38.36	45.95		0.1%		23.5	61%	51%	22.5	0.1%		23.5	61%	51%	22.4	0.1%		23.5	61%	51%	22.4
Blackstone Valley South	Valley #102	T22	115	13.8	31.6	40.29		0.1%		20.0	63%	50%	20.3	0.1%		20.1	63%	50%	20.2	0.1%		20.1	64%	50%	20.2
Blackstone Valley South	Valley #102	T23	115	24	42.01	51.51		0.1%		3.9	9%	8%	47.6	0.1%		3.9	9%	8%	47.6	0.1%		3.9	9%	8%	47.6
Blackstone Valley South	Washington #126	T261	115	13.8	48	48		0.1%		26.1	54%	54%	21.9	0.1%		26.1	54%	54%	21.9	0.1%		26.1	54%	54%	21.9
Blackstone Valley South	Washington #126	T262	115	13.8	59.27	57.4		0.1%		25.3	43%	44%	32.1	0.1%		25.3	43%	44%	32.1	0.1%		25.3	43%	44%	32.1
Central RI East	APPONAUG 3	3	23	12.47	15.5	19.6		1.9%		10.4	67%	53%	9.2	1.9%		10.6	68%	54%	9.0	1.8%		10.8	70%	55%	8.8
Central RI East	APPONAUG 3	4	23	12.47	11.9	12.6		1.9%		10.0	84%	80%	2.6	1.9%		10.2	86%	81%	2.4	1.8%		10.4	88%	83%	2.2
Central RI East	AUBURN 73	1	23	4.16	10.6	11.8		1.9%		6.1	58%	52%	5.7	1.9%		6.2	59%	53%	5.6	1.8%		6.3	60%	54%	5.5
Central RI East	AUBURN 73	2	23	4.16	9.7	10.6		1.9%		4.1	42%	39%	6.5	1.9%		4.2	43%	39%	6.5	1.8%		4.3	44%	40%	6.4
Central RI East	DRUMROCK 14	3	115	23/12.47	53.0	76.0		1.9%		38.3	72%	50%	37.7	1.9%		39.1	74%	51%	37.0	1.8%		39.8	75%	52%	36.3
Central RI East	DRUMROCK 14	4	115	23	89.0	107.4		1.9%		51.8	58%	48%	55.6	1.9%		52.8	59%	49%	54.6	1.8%		53.8	60%	50%	53.6
Central RI East	DRUMROCK 14	5	115	23/12.47	107.0	107.0		1.9%		72.2	67%	67%	34.8	1.9%		73.6	69%	69%	33.4	1.8%		74.9	70%	70%	32.1
Central RI East	KILVERT STREET 86	1	115	12.47	67.0	84.0	Expected In-Service 2015	1.9%		28.5	43%	34%	55.5	1.9%		29.1	43%	35%	54.9	1.8%		29.6	44%	35%	54.4
Central RI East	KILVERT STREET 87	2	115	12.47	67.0	84.0		1.9%		21.5	32%	26%	62.5	1.9%		21.9	33%	26%	62.1	1.8%		22.3	33%	27%	61.7
Central RI East	LAKEWOOD 57	1	23	4.16	10.1	10.6		1.9%		7.7	76%	72%	2.9	1.9%		7.8	78%	74%	2.8	1.8%		8.0	79%	75%	2.6
Central RI East	LAKEWOOD 57	2	23	4.16	10.2	11.5		1.9%		2.4	23%	21%	9.1	1.9%		2.4	24%	21%	9.1	1.8%		2.5	24%	21%	9.0
Central RI East	LINCOLN AVENUE 72	1	115	12.47	52.1	54.9		1.9%		28.1	54%	51%	26.8	1.9%		28.6	55%	52%	26.3	1.8%		29.1	56%	53%	25.8
Central RI East	LINCOLN AVENUE 72	2	115	12.47	52.1	54.9		1.9%		30.7	59%	56%	24.2	1.9%		31.3	60%	57%	23.7	1.8%		31.8	61%	58%	23.1
Central RI East	PAWTUXET 31	1	23	4.16	4.3	5.1	Planned retire 2015																		
Central RI East	PONTIAC 27	1	115	12.47	50.7	53.3		1.9%		26.2	52%	49%	27.2	1.9%		26.7	53%	50%	26.7	1.8%		27.1	54%	51%	26.2
Central RI East	PONTIAC 27	2	115	12.47	46.5	51.9		1.9%		32.6	70%	63%	19.3	1.9%		33.2	71%	64%	18.7	1.8%		33.8	73%	65%	18.1
Central RI East	SOCKANOSSET 24	1	115	23	50.3	56.8		1.9%		34.6	69%	61%	22.2	1.9%		35.3	70%	62%	21.5	1.8%		35.9	71%	63%	20.9
Central RI East	SOCKANOSSET 24	2	115	23	50.4	57.0		1.9%		31.6	63%	55%	25.4	1.9%		32.2	64%	56%	24.8	1.8%		32.8	65%	57%	24.3
Central RI East	WARWICK 52	1	23	12.47	11.6	12.7		0.7%		8.8	76%	69%	3.9	0.7%		8.8	76%	70%	3.9	0.6%		8.9	77%	70%	3.8
Central RI East	WARWICK 52	4	23	12.47	12.0	12.0		0.7%		9.3	77%	77%	2.7	0.7%		9.3	78%	78%	2.7	0.6%		9.4	78%	78%	2.6
Central RI West	ANTHONY	1	23	12.47	7.8	8.1		0.7%		5.2	67%	64%	2.9	0.7%		5.3	68%	65%	2.8	0.6%		5.3	68%	65%	2.8
Central RI West	ANTHONY	2	23	12.47	7.8	8.1		0.7%		4.9	62%	60%	3.2	0.7%		4.9	63%	60%	3.2	0.6%		4.9	63%	60%	3.2
Central RI West	ARCTIC	1	23	4.16	5.0	5.0		0.7%		3.5	70%	70%	1.5	0.7%		3.5	70%	70%	1.5	0.6%		3.5	71%	70%	1.5
Central RI West	ARCTIC	2	23	4.16	6.7	7.4		0.7%		0.3	4%	4%	7.1	0.7%		0.3	4%	4%	7.1	0.6%		0.3	4%	4%	7.1
Central RI West	COVENTRY	1	23	12.47	11.4	13.5		0.7%		10.4	91%	77%	3.1	0.7%		10.5	92%	78%	3.0	0.6%		10.5	92%	78%	3.0
Central RI West	COVENTRY MITS	1	34.5	12.47	13.0	14.0	In-Service 2013	0.7%		10.1	78%	72%	3.9	0.7%		10.2	79%	73%	3.8	0.6%		10.3	79%	74%	3.7
Central RI West	DIVISION ST	1	34.5	12.47	23.7	27.6		0.7%		16.4	69%	59%	11.2	0.7%		16.5	70%	60%	11.1	0.6%		16.6	70%	60%	11.0
Central RI West	DIVISION ST	2	34.5	12.47	23.7	27.6		0.7%		10.6	45%	38%	17.0	0.7%		10.7	45%	39%	16.9	0.6%		10.8	45%	39%	16.8
Central RI West	HOPE	1	23	12.47	7.5	8.5		0.7%		4.9	65%	58%	3.6	0.7%		5.0	66%	59%	3.5	0.6%		5.0	66%	59%	3.5
Central RI West	HOPE	2*	23	12.47	13.7	16.5		0.7%		8.7	64%	53%	7.8	0.7%		8.7	64%	53%	7.8	0.6%		8.8	64%	53%	7.7
Central RI West	HOPKINS HILL	1*	34.5	12.47	48.8	51.0		0.7%		21.7	44%	43%	29.3	0.7%		21.8	45%	43%	29.2	0.6%		22.0	45%	43%	29.0
Central RI West	HOPKINS HILL	2*	34.5	12.47	49.2	52.0		0.7%		31.5	64%	61%	20.5	0.7%		31.7	64%	61%	20.3	0.6%		31.9	65%	61%	20.1
Central RI West	HUNT RIVER	2	34.5	12.47	11.2	12.7	Planned retire 2017 - Flood Mitigation																		
Central RI West	KENT COUNTY	5	115	12.47	50.0	58.0	Expected In-Service 2017	0.7%		28.0	56%	48%	30.0	0.7%		28.2	56%	49%	29.8	0.6%		28.3	57%	49%	29.7
Central RI West	KENT COUNTY	6	115	12.47	50.7	58.9		0.7%		16.5	33%	28%	42.4	0.7%		16.6	33%	28%	42.3	0.6%		16.7	33%	28%	42.2
Central RI West	KENT COUNTY	1*	115	34.5	57.3	67.6		0.7%		36.6	64%	54%	31.0	0.7%		36.9	64%	55%	30.7	0.6%		37.1	65%	55%	30.5
Central RI West	KENT COUNTY	2*	115	34.5	66.3	69.9		0.7%		38.2	58%	55%	31.7	0.7%		38.4	58%	55%	31.5	0.6%		38.7	58%	55%	31.2
Central RI West	KENT COUNTY	7*	115	34.5	57.3	68.8		0.7%		35.8	62%	52%	33.0	0.7%		36.0	63%	52%	32.8	0.6%		36.2	63%	53%	32.6
Central RI West	NATICK	1	23	12.47	13.2	14.3		0.7%		8.7	66%	61%	5.6	0.7%		8.7	66%	61%	5.6	0.6%		8.8	67%	62%	5.5
Central RI West	NATICK	2	23	12.47	13.5	14.5		0.7%		7.1	53%	49%	7.4	0.7%		7.2	53%	50%	7.3	0.6%		7.2	53%	50%	7.3
Central RI West	WARWICK MALL	1	23	12.47	8.8	8.9		0.7%		4.6	53%	52%	4.3	0.7%		4.7	53%	53%	4.2	0.6%		4.7	53%	53%	4.2
Central RI West	WARWICK MALL	2	23	12.47	8.7	9.1		0.7%		3.1	36%	34%	6.0	0.7%		3.1	36%	34%	6.0	0.6%		3.1	36%	34%	6.0

Transformers - Normal Configuration Summary
2012 Annual Plan for Rhode Island

			System Voltage (kV)		Rating (MVA)			2020						2021						2022					
Study Area	Substation	Tranf. ID.	From	To	SN	SE	Comments	Growth	Spot	MVA	% SN	% SE	N-1 Capacity	Growth	Spot	MVA	% SN	% SE	N-1 Capacity	Growth	Spot	MVA	% SN	% SE	N-1 Capacity
Central RI West	NEW LONDON AVE	1	115	12.47	55.0	60.0	Expected In-Service 2015	0.7%		27.6	50%	46%	32.4	0.7%		27.7	50%	46%	32.3	0.6%		27.9	51%	47%	32.1
East Bay	BARRINGTON 4	1	23	12.47	35.19	35.09		0.2%		20.8	59%	59%	14.3	0.1%		20.8	59%	59%	14.2	0.1%		20.9	59%	60%	14.2
East Bay	BRISTOL 51	1	115	12.47	56.9	63.4		0.2%		19.8	35%	31%	43.6	0.1%		19.8	35%	31%	43.6	0.1%		19.8	35%	31%	43.6
East Bay	BRISTOL 51	2	23	12.47	25.1	29.8		0.2%		10.0	40%	34%	19.8	0.1%		10.0	40%	34%	19.8	0.1%		10.1	40%	34%	19.7
East Bay	KENT CORNERS 47	T1	23	4.16	7.14	7.53		0.2%		2.9	40%	38%	4.7	0.1%		2.9	40%	38%	4.7	0.1%		2.9	40%	38%	4.7
East Bay	KENT CORNERS 47	T2	23	4.16	6.82	8.07		0.2%		4.6	68%	58%	3.4	0.1%		4.7	68%	58%	3.4	0.1%		4.7	68%	58%	3.4
East Bay	PHILLIPSDALE 20	T1	115	23	56	56		0.2%		11.2	20%	20%	44.8	0.1%		11.2	20%	20%	44.8	0.1%		11.2	20%	20%	44.8
East Bay	PHILLIPSDALE 20	T2	115	23	45.32	56.75		0.2%		8.4	19%	15%	48.3	0.1%		8.4	19%	15%	48.3	0.1%		8.4	19%	15%	48.3
East Bay	PHILLIPSDALE 20	T3	23	12.47	25.16	28.87		0.2%		13.3	53%	46%	15.6	0.1%		13.3	53%	46%	15.6	0.1%		13.3	53%	46%	15.5
East Bay	WAMPANOAG 48	T1	115	12.47	42.83	52.72		0.2%		30.3	71%	57%	22.4	0.1%		30.3	71%	58%	22.4	0.1%		30.4	71%	58%	22.3
East Bay	WAMPANOAG 48	T2	115	12.47	52.36	55.33		0.2%		27.6	53%	50%	27.8	0.1%		27.6	53%	50%	27.7	0.1%		27.6	53%	50%	27.7
East Bay	WARREN 5	5	115	23	60.96	65.05		0.2%		8.5	14%	13%	56.5	0.1%		8.5	14%	13%	56.5	0.1%		8.5	14%	13%	56.5
East Bay	WARREN 5	6	115	23	59.6	64.17		0.2%		22.1	37%	34%	42.0	0.1%		22.2	37%	35%	42.0	0.1%		22.2	37%	35%	42.0
East Bay	WARREN 5	T1	115	12.47	48.28	53.43		0.2%		14.7	31%	28%	38.7	0.1%		14.7	31%	28%	38.7	0.1%		14.8	31%	28%	38.7
East Bay	WARREN 5	T2	115	12.47	50.62	59.57		0.2%		18.5	37%	31%	41.1	0.1%		18.5	37%	31%	41.1	0.1%		18.5	37%	31%	41.0
East Bay	WATERMAN AVENUE 78	T1	23	12.47	16.36	18.26		0.2%		7.6	47%	42%	10.6	0.1%		7.6	47%	42%	10.6	0.1%		7.6	47%	42%	10.6
East Bay	WATERMAN AVENUE 78	T2	23	12.47	16.36	18.26		0.2%		6.4	39%	35%	11.9	0.1%		6.4	39%	35%	11.9	0.1%		6.4	39%	35%	11.9
Newport	Bailey Brook	191	23	4.16	8.3	8.7	Planned retire 2015 (Newport related)																		
Newport	Bailey Brook	192	23	4.16	8.6	10.4	Planned retire 2015 (Newport related)																		
Newport	Clarke St	651	23	4.16	4.1	4.3	Planned Upgrade 2015	1.6%		3.5	86%	81%	0.8	1.6%		3.5	87%	81%	0.8	1.6%		3.6	88%	84%	0.7
Newport	Clarke St	652	23	4.16	4.5	5.0		1.6%		3.2	71%	64%	1.8	1.6%		3.2	72%	64%	1.8	1.6%		3.3	73%	66%	1.7
Newport	Dexter	361	115	69	121.0	130.0		1.6%		83.1	69%	64%	46.9	1.6%		84.4	70%	65%	45.6	1.6%		85.8	71%	66%	44.2
Newport	Dexter	362	115	69	61.0	65.0		1.6%		35.8	59%	55%	29.2	1.6%		36.4	60%	56%	28.6	1.6%		37.0	61%	57%	28.0
Newport	Dexter	363	115	69	61.0	65.0		1.6%		35.8	59%	55%	29.2	1.6%		36.4	60%	56%	28.6	1.6%		37.0	61%	57%	28.0
Newport	Dexter	364	115	13.8	44.6	47.4		1.6%		30.4	68%	64%	17.0	1.6%		30.9	69%	65%	16.5	1.6%		31.4	70%	66%	16.0
Newport	Eldred	451	23	4.16	7.9	9.6	Planned retire 2015																		
Newport	Eldred NEW	1	23	4.16	5.8	7.0	Expected in-service 2015	1.6%		3.0	52%	43%	4.0	1.6%		3.0	52%	43%	4.0	1.6%		3.1	53%	44%	3.9
Newport	Eldred NEW	2	23	4.16	5.8	7.0	Expected in-service 2015	1.6%		2.3	40%	33%	4.7	1.6%		2.3	40%	33%	4.7	1.6%		2.4	41%	34%	4.6
Newport	Gate 2	381	69	23	54.2	63.7		1.6%		19.7	36%	31%	44.0	1.6%		19.2	35%	30%	44.5	1.6%		19.5	36%	31%	44.2
Newport	Gate 2	382	69	23	55.0	60.0	Expected in-service 2015	1.6%		19.7	36%	33%	40.3	1.6%		19.2	35%	32%	40.8	1.6%		19.5	36%	33%	40.5
Newport	Gate 2	731	23	4.16	8.1	8.7	Planned retire 2015 (Newport related)																		
Newport	Harrison	321	23	4.16	8.3	9.7		1.6%		3.1	37%	32%	6.6	1.6%		3.1	37%	32%	6.6	1.6%		3.1	38%	32%	6.6
Newport	Harrison	322	23	4.16	8.1	10.1		1.6%		5.6	69%	55%	4.5	1.6%		5.7	71%	56%	4.4	1.6%		5.8	72%	57%	4.3
Newport	Hospital	461	23	4.16	4.1	4.3		1.6%		2.8	70%	65%	1.5	1.6%		2.9	71%	67%	1.4	1.6%		2.9	72%	67%	1.4
Newport	Hospital	462	23	4.16	4.1	4.3		1.6%		2.3	56%	53%	2.0	1.6%		2.3	57%	53%	2.0	1.6%		2.4	58%	56%	1.9
Newport	Jepson	341	23	4.16	9.7	10.4	Planned retire 2015 (Newport related)																		
Newport	Jepson	371	69	23	16.5	18.5		1.6%		6.1	37%	33%	12.4	1.6%		6.2	37%	34%	12.3	1.6%		6.3	38%	34%	12.2
Newport	Jepson	372	69	23	23.2	24.8		1.6%		11.1	48%	45%	13.7	1.6%		11.3	49%	46%	13.5	1.6%		11.4	49%	46%	13.4
Newport	Jepson	373	69	23	48.9	57.9		1.6%		23.9	49%	41%	34.0	1.6%		24.3	50%	42%	33.6	1.6%		24.7	50%	43%	33.2
Newport	Jepson	374	69	13.8	42.9	48.6		1.6%		24.6	57%	51%	24.0	1.6%		25.0	58%	51%	23.6	1.6%		25.4	59%	52%	23.2
Newport	Jepson	376	69	23	15.4	16.4		1.6%		6.9	44%	42%	9.5	1.6%		7.0	45%	43%	9.4	1.6%		7.1	46%	43%	9.3
Newport	Kingston	311	23	4.16	7.9	9.6		1.6%		5.5	70%	57%	4.1	1.6%		5.6	71%	58%	4.0	1.6%		5.7	72%	59%	3.9
Newport	Kingston	312	23	4.16	7.9	9.6		1.6%		4.4	56%	46%	5.2	1.6%		4.5	57%	47%	5.1	1.6%		4.6	58%	48%	5.0
Newport	Merton	511	23	4.16	2.2	2.4		1.6%		2.1	93%	88%	0.3	1.6%		2.1	95%	88%	0.3	1.6%		2.2	96%	92%	0.2
Newport	Merton	512	23	4.16	8.4	10.0		1.6%		5.4	64%	54%	4.6	1.6%		5.5	65%	55%	4.5	1.6%		5.6	66%	56%	4.4
Newport	Newport Sub	1	69	13.8	55.0	60.0	Expected in-service 2015	1.6%		19.8	36%	33%	40.2	1.6%		20.1	37%	34%	39.9	1.6%		20.4	37%	34%	39.6
Newport	Newport Sub	2	69	13.8	55.0	60.0	Expected in-service 2015	1.6%		18.5	34%	31%	41.5	1.6%		18.8	34%	31%	41.2	1.6%		19.1	35%	32%	40.9
Newport	No. Aquidneck	211	23	4.16	8.0	10.2		1.6%		3.9	49%	38%	6.3	1.6%		4.0	50%	39%	6.2	1.6%		4.0	50%	39%	6.2
Newport	So. Aquidneck	221	23	4.16	7.9	9.6		1.6%		5.0	63%	52%	4.6	1.6%		5.0	64%	52%	4.6	1.6%		5.1	65%	53%	4.5
Newport	Vernon Ave	231	23	4.16	3.6	3.9	Planned retire 2015 (Newport related)																		
Newport	Vernon Ave	232	23	4.16	3.6	3.9	Planned retire 2015 (Newport related)																		
Newport	West Howard	541	23	4.16	12.6	14.8		1.6%		9.0	72%	61%	5.8	1.6%		9.1	73%	61%	5.7	1.6%		9.3	74%	63%	5.5
Newport	West Howard	542	23	4.16	13.1	13.58		1.6%		6.4	49%	47%	7.2	1.6%		6.5	50%	48%	7.1	1.6%		6.6	51%	49%	7.0
North Central RI	Centerdale #50	T1	23	4.16	7.1	7.54		1.9%		3.6	51%	48%	3.9	1.9%		3.7	52%	49%	3.9	1.8%		3.8	53%	50%	3.8
North Central RI	Centerdale #50	T3	23	12.47	7.93	8.34		1.9%		6.0	75%	72%	2.4	1.9%		6.1	77%	73%	2.3	1.8%		6.2	78%	74%	2.1
North Central RI	Chopmist #34	T1	23	12.47	15.96	16.42		1.9%		10.3	64%	62%	6.2	1.9%		10.4	65%	64%	6.0	1.8%		10.6	67%	65%	5.8
North Central RI	Chopmist #34	T2	23	12.47	13.84	13.57		1.9%		8.3	60%	61%	5.3	1.9%		8.5	61%	62%	5.1	1.8%		8.6	62%	64%	4.9
North Central RI	Chopmist #34	T3	23	12.47	12.81	13.94		1.9%		7.4	58%	53%	6.6	1.9%		7.5	59%	54%	6.4	1.8%		7.6	60%	55%	6.3
North Central RI	Farnum Pike #23	T1	115	12.47	64.8	64.8		1.9%		21.0	32%	32%	43.8	1.9%		21.4	33%	33%	43.4	1.8%		21.8	34%	34%	43.0
North Central RI	Farnum Pike #23	T2	115	12.47	64.8	64.8		1.9%		28.7	44%	44%	36.1	1.9%		29.3	45%	45%	35.5	1.8%		29.8	46%	46%	35.0
North Central RI	Johnston #18	T1	115	12.47	25	35		1.9%		18.5	74%	53%	16.5	1.9%		18.9	75%	54%	16.1	1.8%		19.2	77%	55%	15.8
North Central RI	Johnston #18	T1 - 23	115	23	63.4	77		1.9%		25.4	40%	33%	51.6	1.9%		25.9	41%	34%	51.1	1.8%		26.4	42%	34%	50.6
North Central RI	Johnston #18	T3	115	12.47	53.68	56.33		1.9%		29.5	55%	52%	26.8	1.9%		30.1	56%	53%	26.3	1.8%		30.6	57%	54%	25.7
North Central RI	Johnston #18	T4	115	12.47	68.6	74		1.9%		23.1	34%	31%	50.9	1.9%		23.6	34%	32%	50.4	1.8%		24.0	35%	32%	50.0
North Central RI	Johnston #18	T2- 23	115	23	80	90		1.9%		41.5	52%	46%	48.5	1.9%		42.3	53%	47%	47.7	1.8%		43.1	54%	48%	46.9
North Central RI	Manton #69	T2	23	12.47	25.46	26.66		1.9%		19.3	76%	72%	7.4	1.9%		19.6	77%	74%	7.0	1.8%		20.0	78%	75%	6.7
North Central RI	Putnam Pike #38	T1	115	12.47	64.94	68.79		1.9%		29.4	45%	43%	39.4	1.9%		30.0	46%	44%	38.8	1.8%		30.5	47%	44%	38.3
North Central RI	Putnam Pike #38	T2	115	12.47	64.94	68.79		1.9%		24.8	38%	36%	44.0	1.9%		25.3	39%	37%	43.5	1.8%		25.7	40%	37%	43.0
North Central RI	Shun Pike #35	T1	115	12.47	68.6	74	Expected in-service 2018	1.9%		12.5	18%	17%	61.5	1.9%		12.7	19%	17%	61.3	1.8%		13.0	19%	18%	61.0
North Central RI	Shun Pike SIMS	T3	115	13.2	27	30	Expected in-service 2014	1.9%		12.5	46%	42%	17.5	1.9%		12.7	47%	42%	17.3	1.8%		12.9	48%	43%	17.1
North Central RI	West Cranston #21	T1	115	12.47	27.78	29.91		1.9%		9.3	33%	31%	20.6	1.9%		9.5	34%	32%	20.4	1.8%		9.7	35%	32%	20.3
North Central RI	West Cranston #21	T2	115	12.47	27.76	29.86		1.9%		21.7	78%	73%	8.2	1.9%		22.1	80%	74%	7.8	1.8%		22.5	81%	75%	7.4
North Central RI	West Greenville # 45	T3	23	12.47	11.91	13.56		1.9%		3.2	27%	24%	10.4	1.9%		3.3	27%	24%	10.3	1.8%		3.3	28%	24%	10.2
North Central RI	Wolf Hill #19	T1	115	23	65.01	69.83		1.9%		33.0	51%	47%	36.9	1.9%		33.6	52%	48%	36.2	1.8%		34.2	53%	49%	35.6
Providence	Admiral Street #9	T1	23	11/4.16	15	15		0.1%		2.8	19%	19%	12.2	0.1%		2.8	19%	19%	12.2	0.2%		2.8	19%	19%	12.2
Providence	Admiral Street #9	T2	23	11/4.16	15	15		0.1%		3.6	24%	24%	11.4	0.1%		3.6	24%	24%	11.4	0.2%		3.6	24%	24%	11.4
Providence	Admiral Street #9	T3	115	23	62.1	63.7		0.1%		23.4	38%	37%	40.3	0.1%		23.4	38%	37%	40.3	0.2%		23.4	38%	37%	40.3

Transformers - Normal Configuration Summary
2012 Annual Plan for Rhode Island

			System Voltage (kV)		Rating (MVA)			2020						2021						2022					
Study Area	Substation	Tranf. ID.	From	To	SN	SE	Comments	Growth	Spot	MVA	% SN	% SE	N-1 Capacity	Growth	Spot	MVA	% SN	% SE	N-1 Capacity	Growth	Spot	MVA	% SN	% SE	N-1 Capacity
Providence	Admiral Street #9	T4	115	23	63	64.9		0.1%		22.8	36%	35%	42.1	0.1%		22.8	36%	35%	42.1	0.2%		22.9	36%	35%	42.0
Providence	Admiral Street #9	T5	23	4.16	15.13	15.36		0.1%		6.1	40%	39%	9.3	0.1%		6.1	40%	40%	9.3	0.2%		6.1	40%	40%	9.3
Providence	Clarkson Street #13	T1	115	12.47	65.46	81.01		0.1%		37.1	57%	46%	43.9	0.1%		37.1	57%	46%	43.9	0.2%		37.2	57%	46%	43.8
Providence	Clarkson Street #13	T2	115	12.47	65.16	80.24		0.1%		35.5	54%	44%	44.8	0.1%		35.5	55%	44%	44.7	0.2%		35.6	55%	44%	44.6
Providence	Dyer St #2	T1	11.5	4.16	18.27	19.78		0.1%		8.1	45%	41%	11.6	0.1%		8.2	45%	41%	11.6	0.2%		8.2	45%	41%	11.6
Providence	Dyer St #2	T2	11.5	4.16	18.25	19.74		0.1%		5.4	30%	27%	14.3	0.1%		5.4	30%	27%	14.3	0.2%		5.4	30%	28%	14.3
Providence	East George St. #77	T1	23	4.16	12.59	15.27		0.1%		4.4	35%	29%	10.8	0.1%		4.5	35%	29%	10.8	0.2%		4.5	35%	29%	10.8
Providence	East George St. #77	T2	23	4.16	12.59	15.27		0.1%		4.8	38%	32%	10.5	0.1%		4.8	38%	32%	10.4	0.2%		4.8	38%	32%	10.4
Providence	Elmwood #7 (12.47 kV)	T2	23	12.47	40.58	45.78		0.1%		30.5	75%	67%	15.3	0.1%		30.5	75%	67%	15.3	0.2%		30.6	75%	67%	15.2
Providence	Franklin Square #11	2207	11.5	23	16.06	18.75		0.1%		7.2	45%	39%	11.5	0.1%		7.2	45%	39%	11.5	0.2%		7.3	45%	39%	11.5
Providence	Franklin Square #11	2210	11.5	23	17.14	15.85		0.1%		10.8	63%	68%	5.1	0.1%		10.8	63%	68%	5.0	0.2%		10.8	63%	68%	5.0
Providence	Franklin Square #11	2220	11.5	23	17.7	19.3		0.1%		15.6	88%	81%	3.7	0.1%		15.6	88%	81%	3.7	0.2%		15.6	88%	81%	3.7
Providence	Franklin Square #11	2260	11.5	23	16.06	18.75		0.1%		5.2	33%	28%	13.5	0.1%		5.2	33%	28%	13.5	0.2%		5.2	33%	28%	13.5
Providence	Franklin Square #11	3320	11.5	34.5	25.87	29.66		0.1%		7.8	30%	26%	21.9	0.1%		7.8	30%	26%	21.9	0.2%		7.8	30%	26%	21.9
Providence	Franklin Square #11	3324	11.5	34.5	25.75	29.5		0.1%		10.0	39%	34%	19.5	0.1%		10.0	39%	34%	19.5	0.2%		10.0	39%	34%	19.5
Providence	Franklin Square #11	T1	115	11.5	50.65	61.04		0.1%		23.4	46%	38%	37.7	0.1%		23.4	46%	38%	37.7	0.2%		23.4	46%	38%	37.6
Providence	Franklin Square #11	T2	115	11.5	51.24	56.69		0.1%		16.7	33%	29%	40.0	0.1%		16.7	33%	29%	40.0	0.2%		16.7	33%	30%	40.0
Providence	Franklin Square #11	T3	115	11.5	51.24	56.69		0.1%		28.9	56%	51%	27.8	0.1%		29.0	56%	51%	27.7	0.2%		29.0	57%	51%	27.7
Providence	Geneva #71	T1	23	4.16	11.54	14.19		0.1%		8.5	74%	60%	5.7	0.1%		8.5	74%	60%	5.7	0.2%		8.5	74%	60%	5.7
Providence	Harris Avenue #12	T1	23	4.16	11.48	12.72		0.1%		4.7	41%	37%	8.0	0.1%		4.7	41%	37%	8.0	0.2%		4.7	41%	37%	8.0
Providence	Harris Avenue #12	T2	23	4.16	9.06	11.52		0.1%		2.5	27%	21%	9.1	0.1%		2.5	27%	21%	9.0	0.2%		2.5	27%	22%	9.0
Providence	Huntington Park #67	T1	23	4.16	3	3		0.1%		2.0	66%	66%	1.0	0.1%		2.0	67%	67%	1.0	0.2%		2.0	67%	67%	1.0
Providence	Knightsville #66	T1	22.9	4.16	10.48	11.02		0.1%		6.7	64%	61%	4.3	0.1%		6.7	64%	61%	4.3	0.2%		6.7	64%	61%	4.3
Providence	Knightsville #66	T2	22.9	4.16	10.48	11.02		0.1%		4.6	44%	42%	6.4	0.1%		4.6	44%	42%	6.4	0.2%		4.6	44%	42%	6.4
Providence	Lippitt Hill #79	T1	22.9	12.47	25.11	27.54		0.1%		7.7	31%	28%	19.8	0.1%		7.7	31%	28%	19.8	0.2%		7.7	31%	28%	19.8
Providence	Lippitt Hill #79	T2	22.9	12.47	25.11	27.54		0.1%		9.0	36%	33%	18.6	0.1%		9.0	36%	33%	18.6	0.2%		9.0	36%	33%	18.6
Providence	Olneyville #6	T1	11.5	4.16	11.8	13.02		0.1%		4.9	41%	37%	8.1	0.1%		4.9	41%	38%	8.1	0.2%		4.9	41%	38%	8.1
Providence	Olneyville #6	T3	11.5	4.16	11.8	13.02		0.1%		3.3	28%	25%	9.7	0.1%		3.3	28%	25%	9.7	0.2%		3.3	28%	25%	9.7
Providence	Point Street #76	T1	115	12.47	77	89.8		0.1%		34.8	45%	39%	55.0	0.1%		34.9	45%	39%	54.9	0.2%		35.0	45%	39%	54.8
Providence	Point Street #76	T2	115	12.47	70.86	79.98		0.1%		36.2	51%	45%	43.8	0.1%		36.3	51%	45%	43.7	0.2%		36.3	51%	45%	43.6
Providence	Rochambeau Ave #37	T1	22.9	4.16	11.96	13.12		0.1%		5.3	44%	40%	7.8	0.1%		5.3	45%	41%	7.8	0.2%		5.3	45%	41%	7.8
Providence	Rochambeau Ave #37	T2	11.45	4.16	11.02	13.04		0.1%		3.6	33%	27%	9.5	0.1%		3.6	33%	28%	9.4	0.2%		3.6	33%	28%	9.4
Providence	South Street #1	24	11.5	23	9.1	10.23		0.1%		6.1	67%	60%	4.1	0.1%		6.1	67%	60%	4.1	0.2%		6.1	67%	60%	4.1
Providence	South Street #1	2201	11.5	23	9.1	10.23		0.1%		3.4	38%	34%	6.8	0.1%		3.5	38%	34%	6.8	0.2%		3.5	38%	34%	6.8
Providence	South Street #1	2216	11.5	23	10	10		0.1%		4.2	42%	42%	5.8	0.1%		4.2	42%	42%	5.8	0.2%		4.2	42%	42%	5.8
Providence	South Street #1	2248	11.5	23	12.81	14.33		0.1%		8.2	64%	57%	6.1	0.1%		8.2	64%	57%	6.1	0.2%		8.3	64%	58%	6.1
Providence	South Street #1	T1	115	11.5	66.34	78.75		0.1%		32.3	49%	41%	46.5	0.1%		32.3	49%	41%	46.5	0.2%		32.4	49%	41%	46.4
Providence	South Street #1	T2	115	11.5	66.78	77.14		0.1%		25.6	38%	33%	51.6	0.1%		25.6	38%	33%	51.5	0.2%		25.7	38%	33%	51.5
Providence	South Street #1	T3	115	11.5	72.69	91.22		0.1%		32.3	44%	35%	59.0	0.1%		32.3	44%	35%	58.9	0.2%		32.4	45%	35%	58.9
Providence	Sprague St. #36	T1	23	4.16	10.58	11.85		0.1%		2.8	26%	23%	9.1	0.1%		2.8	26%	24%	9.1	0.2%		2.8	26%	24%	9.1
Providence	Sprague St. #36	T2	23	4.16	10.79	12		0.1%		3.2	30%	27%	8.8	0.1%		3.2	30%	27%	8.8	0.2%		3.2	30%	27%	8.8
South County East	BONNET 42	2	34.5	12.47	11.3	12.2		1.9%		12.2	108%	100%	0.0	1.9%		12.4	110%	102%	-0.2	1.8%		12.7	112%	104%	-0.5
South County East	DAVISVILLE 84	1	115	34.5	45.3	52.1		1.9%		22.9	50%	44%	29.2	1.9%		23.3	51%	45%	28.8	1.8%		23.7	52%	45%	28.4
South County East	DAVISVILLE 84	2A	115	34.5	45.1	51.8		1.9%		27.7	61%	53%	24.1	1.9%		28.3	63%	55%	23.5	1.8%		28.8	64%	56%	23.0
South County East	LAFAYETTE 30	1	34.5	12.47	7.6	8.6		1.9%		6.5	85%	76%	2.1	1.9%		6.6	87%	77%	2.0	1.8%		6.7	88%	78%	1.9
South County East	LAFAYETTE 30	2	34.5	12.47	12.3	13.2		1.9%		11.1	90%	84%	2.1	1.9%		11.3	92%	86%	1.9	1.8%		11.5	94%	87%	1.7
South County East	OLD BAPTIST ROAD 46	1	115	12.47	48.7	54.4		1.9%		23.3	48%	43%	31.1	1.9%		23.7	49%	44%	30.7	1.8%		24.2	50%	44%	30.2
South County East	OLD BAPTIST ROAD 46	2	115	12.47	48.9	51.9		1.9%		23.8	49%	46%	28.1	1.9%		24.2	50%	47%	27.7	1.8%		24.7	50%	48%	27.2
South County East	PEACEDALE 59	1	34.5	12.47	24.2	27.2		1.9%		15.7	65%	58%	11.5	1.9%		16.0	66%	59%	11.2	1.8%		16.3	67%	60%	10.9
South County East	PEACEDALE 59	2	34.5	12.47	24.2	27.2		1.9%		12.7	52%	47%	14.5	1.9%		12.9	53%	47%	14.3	1.8%		13.2	54%	49%	14.0
South County East	QUONSET 83	1	34.5	12.47	25.6	26.7		1.9%		19.5	76%	73%	7.2	1.9%		19.8	77%	74%	6.9	1.8%		20.2	79%	76%	6.5
South County East	TOWER HILL 88	1	115	12.47	50.0	60.0		1.9%		42.3	85%	71%	17.7	1.9%		43.1	86%	72%	16.9	1.8%		43.8	88%	73%	16.2
South County East	WAKEFIELD 17	4	34.5	12.47	12.9	13.5		1.9%		10.2	79%	76%	3.3	1.9%		10.4	80%	77%	3.1	1.8%		10.6	82%	79%	2.9
South County East	WAKEFIELD 17	3T	34.5	12.47	12.9	13.5		1.9%		13.1	102%	97%	0.4	1.9%		13.4	104%	99%	0.1	1.8%		13.6	106%	101%	-0.1
South County East	WAKEFIELD 17	5T	34.5	12.47	12.9	13.5		1.9%		12.2	94%	90%	1.3	1.9%		12.4	96%	92%	1.1	1.8%		12.6	98%	93%	0.9
South County East	WEST KINGSTON 62	1	115	34.5	43.9	55.7		1.9%		32.2	73%	58%	23.5	1.9%		32.8	75%	59%	22.9	1.8%		33.3	76%	60%	22.4
South County East	WEST KINGSTON 62	2	115	34.5	75.8	93.5		1.9%		48.0	63%	51%	45.5	1.9%		48.9	64%	52%	44.6	1.8%		49.8	66%	53%	43.7
South County West	ASHAWAY 43	1	34.5	12.47	8.4	9.1	Planned retire 2014 (Hopkinton related)																		
South County West	HOPE VALLEY 41	1	34.5	12.47	7.3	9.3	Planned retire 2014 (Hopkinton related)																		
South County West	HOPKINTON	1	115	12.47	50.0	55.0	Expected in-service 2014	1.9%		33.8	68%	61%	21.2	1.9%		34.4	69%	63%	20.6	1.8%		35.1	70%	64%	19.9
South County West	HOPKINTON	2	115	12.47	50.0	55.0	Expected in-service 2014	1.9%		29.3	59%	53%	25.7	1.9%		29.9	60%	54%	25.1	1.8%		30.4	61%	55%	24.6
South County West	KENYON 68	1	115	12.47	49.7	53.7		1.9%		25.8	52%	48%	27.9	1.9%		26.3	53%	49%	27.4	1.8%		26.7	54%	50%	27.0
South County West	KENYON 68	2	115	12.47	49.7	53.7		1.9%		20.3	41%	38%	33.4	1.9%		20.7	42%	39%	33.0	1.8%		21.1	42%	39%	32.6
South County West	LANGWORTHY 86	1	34.5	12.47	8.2	9.3	Planned retire 2014 (Hopkinton related)																		
South County West	LANGWORTHY 86	1	34.5	12.47	12.0	14.0	Expected in-service 2014	1.9%		11.4	95%	81%	2.6	1.9%		11.6	97%	83%	2.4	1.8%		11.8	98%	84%	2.2
South County West	WESTERLY 16	2	34.5	12.47	25.6	26.7	Planned retire 2014 (Hopkinton related)																		
South County West	WESTERLY 16	4	34.5	12.47	25.6	26.7	Planned retire 2014 (Hopkinton related)																		
South County West	WOOD RIVER 85	10	115	34.5	48.2	52.4		1.9%		4.0	8%	8%	48.4	1.9%		4.1	8%	8%	48.3	1.8%		4.2	9%	8%	48.2
South County West	WOOD RIVER 85	20	115	34.5	91.2	106.6		1.9%		17.7	19%	17%	88.9	1.9%		18.0	20%	17%	88.6	1.8%		18.3	20%	17%	88.3
Tiverton	TIVERTON 33	1	115	12.47	33.4	33.0				16.1	48%	49%	16.9			16.1	48%	49%	16.9			16.2	48%	49%	16.9
Tiverton	TIVERTON 33	2	115	12.47	49.4	53.7				17.8	36%	33%	35.9			17.8	36%	33%	35.9			17.8	36%	33%	35.9

Transformers - Normal Configuration Summary
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			System Voltage (kV)		Rating (MVA)			2023						2024						2025					
Study Area	Substation	Tranf. ID.	From	To	SN	SE	Comments	Growth	Spot	MVA	% SN	% SE	N-1 Capacity	Growth	Spot	MVA	% SN	% SE	N-1 Capacity	Growth	Spot	MVA	% SN	% SE	N-1 Capacity
Blackstone Valley North	Farnum #105	T1	115	23	37.3	37.3		0.1%		4.1	11%	11%	33.2	0.1%		4.1	11%	11%	33.2	0.1%		4.1	11%	11%	33.2
Blackstone Valley North	Highland Dr	T1	115	13.8	53	62	Estimated in-service 2014	0.1%		20.9	39%	34%	41.1	0.1%		20.9	39%	34%	41.1	0.1%		20.9	39%	34%	41.1
Blackstone Valley North	Highland Dr	T2	115	13.8	53	62	Estimated in-service 2014	0.1%		21.0	40%	34%	41.0	0.1%		21.0	40%	34%	41.0	0.1%		21.0	40%	34%	41.0
Blackstone Valley North	Nasonville #127	T271	115	13.8	47.8	47.8		0.1%		31.0	65%	65%	16.8	0.1%		31.1	65%	65%	16.7	0.1%		31.1	65%	65%	16.7
Blackstone Valley North	Riverside #108	T81	115	13.8	41.83	45.23		0.1%		21.3	51%	47%	24.0	0.1%		21.3	51%	47%	23.9	0.1%		21.3	51%	47%	23.9
Blackstone Valley North	Riverside #108	T82	115	13.8	49.62	58.74		0.1%		25.6	52%	44%	33.1	0.1%		25.6	52%	44%	33.1	0.1%		25.7	52%	44%	33.1
Blackstone Valley North	Staples #112	T124	115	13.8	47.8	47.8		0.1%		27.2	57%	57%	20.6	0.1%		27.2	57%	57%	20.6	0.1%		27.2	57%	57%	20.6
Blackstone Valley North	West Farnum	T1	115	13.8	20	20	Retire 2012																		
Blackstone Valley North	Woonsocket	T1	115	13.8	47.8	50	In-Service 2012	0.1%		26.1	55%	52%	23.9	0.1%		26.1	55%	52%	23.9	0.1%		26.1	55%	52%	23.9
Blackstone Valley South	Central Falls #104	North (J5 & J7)	13.8	4.16	3	3		0.1%		2.4	81%	81%	0.6	0.1%		2.4	81%	81%	0.6	0.1%		2.4	81%	81%	0.6
Blackstone Valley South	Central Falls #104	South (J1 & J3)	13.8	4.16	3.12	3.12		0.1%		1.5	47%	47%	1.6	0.1%		1.5	47%	47%	1.6	0.1%		1.5	47%	47%	1.6
Blackstone Valley South	Centre Street #106	(J1, J3, J7)	13.8	4.16	3.1	3.1		0.1%		2.5	80%	80%	0.6	0.1%		2.5	80%	80%	0.6	0.1%		2.5	80%	80%	0.6
Blackstone Valley South	Cottage St #109	(J1, J3, J5)	13.8	4.16	8.25	9.43		0.1%		6.4	78%	68%	3.0	0.1%		6.4	78%	68%	3.0	0.1%		6.4	78%	68%	3.0
Blackstone Valley South	Crossman St #111	(J1 & J3)	13.8	4.16	8.26	9.44		0.1%		3.2	39%	34%	6.2	0.1%		3.2	39%	34%	6.2	0.1%		3.2	39%	34%	6.2
Blackstone Valley South	Daggett Ave #113	(J1 & J2)	13.8	4.16	4.23	5.02		0.1%		2.2	52%	44%	2.8	0.1%		2.2	52%	44%	2.8	0.1%		2.2	52%	44%	2.8
Blackstone Valley South	Front #24	J1	13.8	4.16	3.1	3.1		0.1%		1.2	37%	37%	1.9	0.1%		1.2	37%	37%	1.9	0.1%		1.2	38%	38%	1.9
Blackstone Valley South	Hyde Avenue #28	(J1 & J2)	13.8	4.16	5.25	5.25		0.1%		2.0	39%	39%	3.2	0.1%		2.0	39%	39%	3.2	0.1%		2.0	39%	39%	3.2
Blackstone Valley South	Lee St. #30	(J1, J3, J5)	13.8	4.16	7	7		0.1%		5.0	71%	71%	2.0	0.1%		5.0	71%	71%	2.0	0.1%		5.0	71%	71%	2.0
Blackstone Valley South	Pawtucket No.1 #107	T71	115	13.8	48	48		0.1%		27.7	58%	58%	20.3	0.1%		27.7	58%	58%	20.3	0.1%		27.7	58%	58%	20.3
Blackstone Valley South	Pawtucket No.1 #107	T73A	115	13.8	48	48		0.1%		41.1	86%	86%	6.9	0.1%		41.2	86%	86%	6.8	0.1%		41.2	86%	86%	6.8
Blackstone Valley South	Pawtucket No.1 #107	T74	115	13.8	48	48		0.1%		30.2	63%	63%	17.8	0.1%		30.2	63%	63%	17.8	0.1%		30.3	63%	63%	17.7
Blackstone Valley South	Pawtucket No.2 #148	T1	13.8	4.16	7.6	9.36		0.1%		2.1	27%	22%	7.3	0.1%		2.1	27%	22%	7.3	0.1%		2.1	27%	22%	7.3
Blackstone Valley South	Pawtucket No.2 #148	T2	13.8	4.16	7.6	9.36		0.1%		3.2	42%	34%	6.2	0.1%		3.2	42%	34%	6.2	0.1%		3.2	42%	34%	6.2
Blackstone Valley South	Southeast #60		13.8	4.16	7	7		0.1%		2.4	34%	34%	4.6	0.1%		2.4	34%	34%	4.6	0.1%		2.4	34%	34%	4.6
Blackstone Valley South	Valley #102	T21	115	13.8	38.36	45.95		0.1%		23.6	61%	51%	22.4	0.1%		23.6	61%	51%	22.4	0.1%		23.6	62%	51%	22.3
Blackstone Valley South	Valley #102	T22	115	13.8	31.6	40.29		0.1%		20.1	64%	50%	20.2	0.1%		20.1	64%	50%	20.2	0.1%		20.1	64%	50%	20.2
Blackstone Valley South	Valley #102	T23	115	24	42.01	51.51		0.1%		3.9	9%	8%	47.6	0.1%		3.9	9%	8%	47.6	0.1%		3.9	9%	8%	47.6
Blackstone Valley South	Washington #126	T261	115	13.8	48	48		0.1%		26.2	54%	54%	21.8	0.1%		26.2	55%	55%	21.8	0.1%		26.2	55%	55%	21.8
Blackstone Valley South	Washington #126	T262	115	13.8	59.27	57.4		0.1%		25.4	43%	44%	32.0	0.1%		25.4	43%	44%	32.0	0.1%		25.4	43%	44%	32.0
Central RI East	APPONAUG 3	3	23	12.47	15.5	19.6		1.8%		11.0	71%	56%	8.6	1.8%		11.2	72%	57%	8.4	1.7%		11.4	73%	58%	8.2
Central RI East	APPONAUG 3	4	23	12.47	11.9	12.6		1.8%		10.6	89%	84%	2.0	1.8%		10.8	91%	86%	1.8	1.7%		11.0	92%	87%	1.6
Central RI East	AUBURN 73	1	23	4.16	10.6	11.8		1.8%		6.5	61%	55%	5.3	1.8%		6.6	62%	56%	5.2	1.7%		6.7	63%	57%	5.1
Central RI East	AUBURN 73	2	23	4.16	9.7	10.6		1.8%		4.3	45%	41%	6.3	1.8%		4.4	46%	41%	6.2	1.7%		4.5	46%	42%	6.2
Central RI East	DRUMROCK 14	3	115	23/12.47	53.0	76.0		1.8%		40.5	76%	53%	35.6	1.8%		41.2	78%	54%	34.8	1.7%		41.9	79%	55%	34.1
Central RI East	DRUMROCK 14	4	115	23	89.0	107.4		1.8%		54.7	61%	51%	52.7	1.8%		55.7	63%	52%	51.7	1.7%		56.6	64%	53%	50.8
Central RI East	DRUMROCK 14	5	115	23/12.47	107.0	107.0		1.8%		76.3	71%	71%	30.7	1.8%		77.6	73%	73%	29.4	1.7%		79.0	74%	74%	28.0
Central RI East	KILVERT STREET 86	1	115	12.47	67.0	84.0	Expected In-Service 2015	1.8%		30.1	45%	36%	53.9	1.8%		30.7	46%	37%	53.3	1.7%		31.2	47%	37%	52.8
Central RI East	KILVERT STREET 87	2	115	12.47	67.0	84.0		1.8%		22.7	34%	27%	61.3	1.8%		23.1	34%	27%	60.9	1.7%		23.5	35%	28%	60.5
Central RI East	LAKEWOOD 57	1	23	4.16	10.1	10.6		1.8%		8.1	81%	76%	2.5	1.8%		8.3	82%	78%	2.4	1.7%		8.4	83%	79%	2.2
Central RI East	LAKEWOOD 57	2	23	4.16	10.2	11.5		1.8%		2.5	25%	22%	9.0	1.8%		2.5	25%	22%	8.9	1.7%		2.6	25%	23%	8.9
Central RI East	LINCOLN AVENUE 72	1	115	12.47	52.1	54.9		1.8%		29.7	57%	54%	25.3	1.8%		30.2	58%	55%	24.7	1.7%		30.7	59%	56%	24.2
Central RI East	LINCOLN AVENUE 72	2	115	12.47	52.1	54.9		1.8%		32.4	62%	59%	22.5	1.8%		33.0	63%	60%	21.9	1.7%		33.5	64%	61%	21.4
Central RI East	PAWTUXET 31	1	23	4.16	4.3	5.1	Planned retire 2015																		
Central RI East	PONTIAC 27	1	115	12.47	50.7	53.3		1.8%		27.6	55%	52%	25.7	1.8%		28.1	56%	53%	25.2	1.7%		28.6	56%	54%	24.7
Central RI East	PONTIAC 27	2	115	12.47	46.5	51.9		1.8%		34.4	74%	66%	17.5	1.8%		35.0	75%	67%	16.9	1.7%		35.6	77%	69%	16.3
Central RI East	SOCKANOSSET 24	1	115	23	50.3	56.8		1.8%		36.6	73%	64%	20.3	1.8%		37.2	74%	66%	19.6	1.7%		37.9	75%	67%	19.0
Central RI East	SOCKANOSSET 24	2	115	23	50.4	57.0		1.8%		33.4	66%	58%	23.7	1.8%		34.0	67%	60%	23.1	1.7%		34.5	69%	61%	22.5
Central RI East	WARWICK 52	1	23	12.47	11.6	12.7		0.6%		8.9	77%	70%	3.8	0.6%		9.0	77%	71%	3.7	0.6%		9.0	78%	71%	3.7
Central RI East	WARWICK 52	4	23	12.47	12.0	12.0		0.6%		9.4	79%	79%	2.6	0.6%		9.5	79%	79%	2.5	0.6%		9.6	80%	80%	2.4
Central RI West	ANTHONY	1	23	12.47	7.8	8.1		0.6%		5.3	68%	65%	2.8	0.6%		5.4	69%	67%	2.7	0.6%		5.4	69%	67%	2.7
Central RI West	ANTHONY	2	23	12.47	7.8	8.1		0.6%		5.0	64%	62%	3.1	0.6%		5.0	64%	62%	3.1	0.6%		5.0	64%	62%	3.1
Central RI West	ARCTIC	1	23	4.16	5.0	5.0		0.6%		3.6	71%	72%	1.4	0.6%		3.6	72%	72%	1.4	0.6%		3.6	72%	72%	1.4
Central RI West	ARCTIC	2	23	4.16	6.7	7.4		0.6%		0.3	4%	4%	7.1	0.6%		0.3	4%	4%	7.1	0.6%		0.3	4%	4%	7.1
Central RI West	COVENTRY	1	23	12.47	11.4	13.5		0.6%		10.6	93%	79%	2.9	0.6%		10.7	94%	79%	2.8	0.6%		10.7	94%	79%	2.8
Central RI West	COVENTRY MITS	1	34.5	12.47	13.0	14.0	In-Service 2013	0.6%		10.3	79%	74%	3.7	0.6%		10.4	80%	74%	3.6	0.6%		10.5	80%	75%	3.5
Central RI West	DIVISION ST	1	34.5	12.47	23.7	27.6		0.6%		16.7	71%	61%	10.9	0.6%		16.8	71%	61%	10.8	0.6%		16.9	71%	61%	10.7
Central RI West	DIVISION ST	2	34.5	12.47	23.7	27.6		0.6%		10.8	46%	39%	16.8	0.6%		10.9	46%	39%	16.7	0.6%		11.0	46%	40%	16.6
Central RI West	HOPE	1	23	12.47	7.5	8.5		0.6%		5.0	67%	59%	3.5	0.6%		5.0	67%	59%	3.5	0.6%		5.1	67%	60%	3.4
Central RI West	HOPE	2*	23	12.47	13.7	16.5		0.6%		8.9	65%	54%	7.6	0.6%		8.9	65%	54%	7.6	0.6%		9.0	66%	55%	7.5
Central RI West	HOPKINS HILL	1*	34.5	12.47	48.8	51.0		0.6%		22.1	45%	43%	28.9	0.6%		22.2	46%	44%	28.8	0.6%		22.4	46%	44%	28.6
Central RI West	HOPKINS HILL	2*	34.5	12.47	49.2	52.0		0.6%		32.1	65%	62%	19.9	0.6%		32.3	66%	62%	19.7	0.6%		32.5	66%	63%	19.5
Central RI West	HUNT RIVER	2	34.5	12.47	11.2	12.7	Planned retire 2017 - Flood Mitigation																		
Central RI West	KENT COUNTY	5	115	12.47	50.0	58.0	Expected In-Service 2017	0.6%		28.5	57%	49%	29.5	0.6%		28.7	57%	49%	29.3	0.6%		28.9	58%	50%	29.1
Central RI West	KENT COUNTY	6	115	12.47	50.7	58.9		0.6%		16.8	33%	29%	42.1	0.6%		16.9	33%	29%	42.0	0.6%		17.0	34%	29%	41.9
Central RI West	KENT COUNTY	1*	115	34.5	57.3	67.6		0.6%		37.3	65%	55%	30.3	0.6%		37.5	66%	55%	30.1	0.6%		37.8	66%	56%	29.8
Central RI West	KENT COUNTY	2*	115	34.5	66.3	69.9		0.6%		38.9	59%	56%	31.0	0.6%		39.1	59%	56%	30.8	0.6%		39.4	59%	56%	30.5
Central RI West	KENT COUNTY	7*	115	34.5	57.3	68.8		0.6%		36.5	64%	53%	32.3	0.6%		36.7	64%	53%	32.1	0.6%		36.9	64%	54%	31.9
Central RI West	NATICK	1	23	12.47	13.2	14.3		0.6%		8.8	67%	62%	5.5	0.6%		8.9	67%	62%	5.4	0.6%		9.0	68%	63%	5.3
Central RI West	NATICK	2	23	12.47	13.5	14.5		0.6%		7.2	54%	50%	7.3	0.6%		7.3	54%	50%	7.2	0.6%		7.3	54%	50%	7.2
Central RI West	WARWICK MALL	1	23	12.47	8.8	8.9		0.6%		4.7	54%	53%	4.2	0.6%		4.8	54%	54%	4.1	0.6%		4.8	54%	54%	4.1
Central RI West	WARWICK MALL	2	23	12.47	8.7	9.1		0.6%		3.1	36%	34%	6.0	0.6%		3.2	36%	35%	5.9	0.6%		3.2	37%	35%	5.9

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			System Voltage (kV)		Rating (MVA)			2023						2024						2025					
Study Area	Substation	Tranf. ID.	From	To	SN	SE	Comments	Growth	Spot	MVA	% SN	% SE	N-1 Capacity	Growth	Spot	MVA	% SN	% SE	N-1 Capacity	Growth	Spot	MVA	% SN	% SE	N-1 Capacity
Central RI West	NEW LONDON AVE	1	115	12.47	55.0	60.0	Expected In-Service 2015	0.6%		28.1	51%	47%	31.9	0.6%		28.2	51%	47%	31.8	0.6%		28.4	52%	47%	31.6
East Bay	BARRINGTON 4	1	23	12.47	35.19	35.09		0.1%		20.9	59%	60%	14.2	0.1%		20.9	59%	60%	14.2	0.1%		20.9	60%	60%	14.1
East Bay	BRISTOL 51	1	115	12.47	56.9	63.4		0.1%		19.9	35%	31%	43.5	0.1%		19.9	35%	31%	43.5	0.1%		19.9	35%	31%	43.5
East Bay	BRISTOL 51	2	23	12.47	25.1	29.8		0.1%		10.1	40%	34%	19.7	0.1%		10.1	40%	34%	19.7	0.1%		10.1	40%	34%	19.7
East Bay	KENT CORNERS 47	T1	23	4.16	7.14	7.53		0.1%		2.9	40%	38%	4.7	0.1%		2.9	40%	38%	4.7	0.1%		2.9	40%	38%	4.7
East Bay	KENT CORNERS 47	T2	23	4.16	6.82	8.07		0.1%		4.7	68%	58%	3.4	0.1%		4.7	68%	58%	3.4	0.1%		4.7	69%	58%	3.4
East Bay	PHILLIPSDALE 20	T1	115	23	56	56		0.1%		11.2	20%	20%	44.8	0.1%		11.2	20%	20%	44.8	0.1%		11.3	20%	20%	44.7
East Bay	PHILLIPSDALE 20	T2	115	23	45.32	56.75		0.1%		8.4	19%	15%	48.3	0.1%		8.4	19%	15%	48.3	0.1%		8.4	19%	15%	48.3
East Bay	PHILLIPSDALE 20	T3	23	12.47	25.16	28.87		0.1%		13.3	53%	46%	15.5	0.1%		13.4	53%	46%	15.5	0.1%		13.4	53%	46%	15.5
East Bay	WAMPANOAG 48	T1	115	12.47	42.83	52.72		0.1%		30.4	71%	58%	22.3	0.1%		30.4	71%	58%	22.3	0.1%		30.5	71%	58%	22.2
East Bay	WAMPANOAG 48	T2	115	12.47	52.36	55.33		0.1%		27.7	53%	50%	27.7	0.1%		27.7	53%	50%	27.6	0.1%		27.7	53%	50%	27.6
East Bay	WARREN 5	5	115	23	60.96	65.05		0.1%		8.6	14%	13%	56.5	0.1%		8.6	14%	13%	56.5	0.1%		8.6	14%	13%	56.5
East Bay	WARREN 5	6	115	23	59.6	64.17		0.1%		22.2	37%	35%	42.0	0.1%		22.2	37%	35%	42.0	0.1%		22.2	37%	35%	41.9
East Bay	WARREN 5	T1	115	12.47	48.28	53.43		0.1%		14.8	31%	28%	38.6	0.1%		14.8	31%	28%	38.6	0.1%		14.8	31%	28%	38.6
East Bay	WARREN 5	T2	115	12.47	50.62	59.57		0.1%		18.6	37%	31%	41.0	0.1%		18.6	37%	31%	41.0	0.1%		18.6	37%	31%	41.0
East Bay	WATERMAN AVENUE 78	T1	23	12.47	16.36	18.26		0.1%		7.7	47%	42%	10.6	0.1%		7.7	47%	42%	10.6	0.1%		7.7	47%	42%	10.6
East Bay	WATERMAN AVENUE 78	T2	23	12.47	16.36	18.26		0.1%		6.4	39%	35%	11.9	0.1%		6.4	39%	35%	11.9	0.1%		6.4	39%	35%	11.9
Newport	Bailey Brook	191	23	4.16	8.3	8.7	Planned retire 2015 (Newport related)																		
Newport	Bailey Brook	192	23	4.16	8.6	10.4	Planned retire 2015 (Newport related)																		
Newport	Clarke St	651	23	4.16	4.1	4.3	Planned Upgrade 2015	1.6%		3.6	90%	84%	0.7	1.5%		3.7	91%	86%	0.6	1.5%		3.8	92%	88%	0.5
Newport	Clarke St	652	23	4.16	4.5	5.0		1.6%		3.3	74%	66%	1.7	1.5%		3.4	75%	68%	1.6	1.5%		3.4	76%	68%	1.6
Newport	Dexter	361	115	69	121.0	130.0		1.6%		87.2	72%	67%	42.8	1.5%		88.5	73%	68%	41.5	1.5%		89.8	74%	69%	40.2
Newport	Dexter	362	115	69	61.0	65.0		1.6%		37.5	62%	58%	27.5	1.5%		38.1	62%	59%	26.9	1.5%		38.7	63%	60%	26.3
Newport	Dexter	363	115	69	61.0	65.0		1.6%		37.5	62%	58%	27.5	1.5%		38.1	62%	59%	26.9	1.5%		38.7	63%	60%	26.3
Newport	Dexter	364	115	13.8	44.6	47.4		1.6%		31.9	71%	67%	15.5	1.5%		32.3	72%	68%	15.1	1.5%		32.8	74%	69%	14.6
Newport	Eldred	451	23	4.16	7.9	9.6	Planned retire 2015																		
Newport	Eldred NEW	1	23	4.16	5.8	7.0	Expected in-service 2015	1.6%		3.1	54%	44%	3.9	1.5%		3.2	55%	46%	3.8	1.5%		3.2	56%	46%	3.8
Newport	Eldred NEW	2	23	4.16	5.8	7.0	Expected in-service 2015	1.6%		2.4	42%	34%	4.6	1.5%		2.5	42%	36%	4.5	1.5%		2.5	43%	36%	4.5
Newport	Gate 2	381	69	23	54.2	63.7		1.6%		19.9	37%	31%	43.8	1.5%		20.2	37%	32%	43.5	1.5%		20.5	38%	32%	43.2
Newport	Gate 2	382	69	23	55.0	60.0	Expected in-service 2015	1.6%		19.9	36%	33%	40.1	1.5%		20.2	37%	34%	39.8	1.5%		20.5	37%	34%	39.5
Newport	Gate 2	731	23	4.16	8.1	8.7	Planned retire 2015 (Newport related)																		
Newport	Harrison	321	23	4.16	8.3	9.7		1.6%		3.2	38%	33%	6.5	1.5%		3.2	39%	33%	6.5	1.5%		3.3	40%	34%	6.4
Newport	Harrison	322	23	4.16	8.1	10.1		1.6%		5.9	73%	58%	4.2	1.5%		6.0	74%	59%	4.1	1.5%		6.1	75%	60%	4.0
Newport	Hospital	461	23	4.16	4.1	4.3		1.6%		3.0	73%	70%	1.3	1.5%		3.0	75%	70%	1.3	1.5%		3.1	76%	72%	1.2
Newport	Hospital	462	23	4.16	4.1	4.3		1.6%		2.4	59%	56%	1.9	1.5%		2.4	60%	56%	1.9	1.5%		2.5	61%	58%	1.8
Newport	Jepson	341	23	4.16	9.7	10.4	Planned retire 2015 (Newport related)																		
Newport	Jepson	371	69	23	16.5	18.5		1.6%		6.4	39%	35%	12.1	1.5%		6.5	39%	35%	12.0	1.5%		6.6	40%	36%	11.9
Newport	Jepson	372	69	23	23.2	24.8		1.6%		11.6	50%	47%	13.2	1.5%		11.8	51%	48%	13.0	1.5%		12.0	52%	48%	12.8
Newport	Jepson	373	69	23	48.9	57.9		1.6%		25.1	51%	43%	32.8	1.5%		25.4	52%	44%	32.5	1.5%		25.8	53%	45%	32.1
Newport	Jepson	374	69	13.8	42.9	48.6		1.6%		25.8	60%	53%	22.8	1.5%		26.2	61%	54%	22.4	1.5%		26.6	62%	55%	22.0
Newport	Jepson	376	69	23	15.4	16.4		1.6%		7.2	47%	44%	9.2	1.5%		7.3	47%	45%	9.1	1.5%		7.4	48%	45%	9.0
Newport	Kingston	311	23	4.16	7.9	9.6		1.6%		5.8	73%	60%	3.8	1.5%		5.9	74%	61%	3.7	1.5%		5.9	75%	61%	3.7
Newport	Kingston	312	23	4.16	7.9	9.6		1.6%		4.6	59%	48%	5.0	1.5%		4.7	60%	49%	4.9	1.5%		4.8	60%	50%	4.8
Newport	Merton	511	23	4.16	2.2	2.4		1.6%		2.2	98%	92%	0.2	1.5%		2.2	99%	92%	0.2	1.5%		2.3	101%	96%	0.1
Newport	Merton	512	23	4.16	8.4	10.0		1.6%		5.6	67%	56%	4.4	1.5%		5.7	68%	57%	4.3	1.5%		5.8	69%	58%	4.2
Newport	Newport Sub	1	69	13.8	55.0	60.0	Expected in-service 2015	1.6%		20.8	38%	35%	39.2	1.6%		21.1	38%	35%	38.9	1.6%		21.4	39%	36%	38.6
Newport	Newport Sub	2	69	13.8	55.0	60.0	Expected in-service 2015	1.6%		19.4	35%	32%	40.6	1.6%		19.7	36%	33%	40.3	1.6%		20.0	36%	33%	40.0
Newport	No. Aquidneck	211	23	4.16	8.0	10.2		1.6%		4.1	51%	40%	6.1	1.5%		4.1	52%	40%	6.1	1.5%		4.2	53%	41%	6.0
Newport	So. Aquidneck	221	23	4.16	7.9	9.6		1.6%		5.2	66%	54%	4.4	1.5%		5.3	67%	55%	4.3	1.5%		5.4	68%	56%	4.2
Newport	Vernon Ave	231	23	4.16	3.6	3.9	Planned retire 2015 (Newport related)																		
Newport	Vernon Ave	232	23	4.16	3.6	3.9	Planned retire 2015 (Newport related)																		
Newport	West Howard	541	23	4.16	12.6	14.8		1.6%		9.4	75%	64%	5.4	1.5%		9.6	76%	65%	5.2	1.5%		9.7	77%	66%	5.1
Newport	West Howard	542	23	4.16	13.1	13.58		1.6%		6.8	52%	50%	6.8	1.5%		6.9	52%	51%	6.7	1.5%		7.0	53%	52%	6.6
North Central RI	Centerdale #50	T1	23	4.16	7.1	7.54		1.8%		3.9	54%	51%	3.7	1.8%		3.9	56%	52%	3.6	1.8%		4.0	57%	54%	3.5
North Central RI	Centerdale #50	T3	23	12.47	7.93	8.34		1.8%		6.3	80%	76%	2.0	1.8%		6.4	81%	77%	1.9	1.8%		6.5	82%	78%	1.8
North Central RI	Chopmist #34	T1	23	12.47	15.96	16.42		1.8%		10.8	68%	66%	5.6	1.8%		11.0	69%	67%	5.4	1.8%		11.2	70%	68%	5.2
North Central RI	Chopmist #34	T2	23	12.47	13.84	13.57		1.8%		8.8	63%	65%	4.8	1.8%		8.9	65%	66%	4.6	1.8%		9.1	66%	67%	4.5
North Central RI	Chopmist #34	T3	23	12.47	12.81	13.94		1.8%		7.8	61%	56%	6.2	1.8%		7.9	62%	57%	6.0	1.8%		8.1	63%	58%	5.9
North Central RI	Farnum Pike #23	T1	115	12.47	64.8	64.8		1.8%		22.2	34%	34%	42.6	1.8%		22.6	35%	35%	42.2	1.8%		23.0	35%	35%	41.8
North Central RI	Farnum Pike #23	T2	115	12.47	64.8	64.8		1.8%		30.3	47%	47%	34.5	1.8%		30.9	48%	48%	33.9	1.8%		31.4	48%	48%	33.4
North Central RI	Johnston #18	T1	115	12.47	25	35		1.8%		19.5	78%	56%	15.5	1.8%		19.9	80%	57%	15.1	1.8%		20.3	81%	58%	14.7
North Central RI	Johnston #18	T1 - 23	115	23	63.4	77		1.8%		26.8	42%	35%	50.2	1.8%		27.3	43%	35%	49.7	1.8%		27.8	44%	36%	49.2
North Central RI	Johnston #18	T3	115	12.47	53.68	56.33		1.8%		31.2	58%	55%	25.2	1.8%		31.7	59%	56%	24.6	1.8%		32.3	60%	57%	24.0
North Central RI	Johnston #18	T4	115	12.47	68.6	74		1.8%		24.4	36%	33%	49.6	1.8%		24.9	36%	34%	49.1	1.8%		25.3	37%	34%	48.7
North Central RI	Johnston #18	T2- 23	115	23	80	90		1.8%		43.9	55%	49%	46.1	1.8%		44.6	56%	50%	45.4	1.8%		45.4	57%	50%	44.6
North Central RI	Manton #69	T2	23	12.47	25.46	26.66		1.8%		20.3	80%	76%	6.3	1.8%		20.7	81%	78%	6.0	1.8%		21.1	83%	79%	5.6
North Central RI	Putnam Pike #38	T1	115	12.47	64.94	68.79		1.8%		31.1	48%	45%	37.7	1.8%		31.6	49%	46%	37.1	1.8%		32.2	50%	47%	36.6
North Central RI	Putnam Pike #38	T2	115	12.47	64.94	68.79		1.8%		26.2	40%	38%	42.6	1.8%		26.7	41%	39%	42.1	1.8%		27.2	42%	39%	41.6
North Central RI	Shun Pike #35	T1	115	12.47	68.6	74	Expected in-service 2018	1.8%		13.3	19%	18%	60.7	1.8%		13.6	20%	18%	60.4	1.8%		14.0	20%	19%	60.0
North Central RI	Shun Pike SIMS	T3	115	13.2	27	30	Expected in-service 2014	1.8%		13.3	49%	44%	16.7	1.8%		13.6	50%	45%	16.4	1.8%		14.0	52%	47%	16.0
North Central RI	West Cranston #21	T1	115	12.47	27.78	29.91		1.8%		9.8	35%	33%	20.1	1.8%		10.0	36%	33%	19.9	1.8%		10.2	37%	34%	19.7
North Central RI	West Cranston #21	T2	115	12.47	27.76	29.86		1.8%		22.9	82%	77%	7.0	1.8%		23.3	84%	78%	6.6	1.8%		23.7	85%	79%	6.1
North Central RI	West Greenville # 45	T3	23	12.47	11.91	13.56		1.8%		3.4	28%	25%	10.2	1.8%		3.4	29%	25%	10.1	1.8%		3.5	29%	26%	10.1
North Central RI	Wolf Hill #19	T1	115	23	65.01	69.83		1.8%		34.8	54%	50%	35.0	1.8%		35.4	55%	51%	34.4	1.8%		36.1	56%	52%	33.7
Providence	Admiral Street #9	T1	23	11/4.16	15	15		0.1%		2.8	19%	19%	12.2	0.1%		2.8	19%	19%	12.2	0.1%		2.8	19%	19%	12.2
Providence	Admiral Street #9	T2	23	11/4.16	15	15		0.1%		3.6	24%	24%	11.4	0.1%		3.6	24%	24%	11.4	0.1%		3.6	24%	24%	11.4
Providence	Admiral Street #9	T3	115	23	62.1	63.7		0.1%		23.5	38%	37%	40.2	0.1%		23.5	38%	37%	40.2	0.1%		23.5	38%	37%	40.2

Transformers - Normal Configuration Summary
2012 Annual Plan for Rhode Island

			System Voltage (kV)		Rating (MVA)			2023						2024						2025					
Study Area	Substation	Tranf. ID.	From	To	SN	SE	Comments	Growth	Spot	MVA	% SN	% SE	N-1 Capacity	Growth	Spot	MVA	% SN	% SE	N-1 Capacity	Growth	Spot	MVA	% SN	% SE	N-1 Capacity
Providence	Admiral Street #9	T4	115	23	63	64.9		0.1%		22.9	36%	35%	42.0	0.1%		22.9	36%	35%	42.0	0.1%		22.9	36%	35%	42.0
Providence	Admiral Street #9	T5	23	4.16	15.13	15.36		0.1%		6.1	40%	40%	9.3	0.1%		6.1	40%	40%	9.3	0.1%		6.1	40%	40%	9.3
Providence	Clarkson Street #13	T1	115	12.47	65.46	81.01		0.1%		37.3	57%	46%	43.8	0.1%		37.3	57%	46%	43.7	0.1%		37.3	57%	46%	43.7
Providence	Clarkson Street #13	T2	115	12.47	65.16	80.24		0.1%		35.6	55%	44%	44.6	0.1%		35.7	55%	44%	44.6	0.1%		35.7	55%	45%	44.5
Providence	Dyer St #2	T1	11.5	4.16	18.27	19.78		0.1%		8.2	45%	41%	11.6	0.1%		8.2	45%	41%	11.6	0.1%		8.2	45%	41%	11.6
Providence	Dyer St #2	T2	11.5	4.16	18.25	19.74		0.1%		5.4	30%	28%	14.3	0.1%		5.4	30%	28%	14.3	0.1%		5.4	30%	28%	14.3
Providence	East George St. #77	T1	23	4.16	12.59	15.27		0.1%		4.5	35%	29%	10.8	0.1%		4.5	36%	29%	10.8	0.1%		4.5	36%	29%	10.8
Providence	East George St. #77	T2	23	4.16	12.59	15.27		0.1%		4.8	38%	32%	10.4	0.1%		4.8	39%	32%	10.4	0.1%		4.9	39%	32%	10.4
Providence	Elmwood #7 (12.47 kV)	T2	23	12.47	40.58	45.78		0.1%		30.6	75%	67%	15.2	0.1%		30.6	76%	67%	15.1	0.1%		30.7	76%	67%	15.1
Providence	Franklin Square #11	2207	11.5	23	16.06	18.75		0.1%		7.3	45%	39%	11.5	0.1%		7.3	45%	39%	11.5	0.1%		7.3	45%	39%	11.5
Providence	Franklin Square #11	2210	11.5	23	17.14	15.85		0.1%		10.8	63%	68%	5.0	0.1%		10.8	63%	68%	5.0	0.1%		10.9	63%	68%	5.0
Providence	Franklin Square #11	2220	11.5	23	17.7	19.3		0.1%		15.6	88%	81%	3.7	0.1%		15.7	88%	81%	3.6	0.1%		15.7	89%	81%	3.6
Providence	Franklin Square #11	2260	11.5	23	16.06	18.75		0.1%		5.2	33%	28%	13.5	0.1%		5.3	33%	28%	13.5	0.1%		5.3	33%	28%	13.5
Providence	Franklin Square #11	3320	11.5	34.5	25.87	29.66		0.1%		7.8	30%	26%	21.8	0.1%		7.8	30%	26%	21.8	0.1%		7.8	30%	26%	21.8
Providence	Franklin Square #11	3324	11.5	34.5	25.75	29.5		0.1%		10.1	39%	34%	19.4	0.1%		10.1	39%	34%	19.4	0.1%		10.1	39%	34%	19.4
Providence	Franklin Square #11	T1	115	11.5	50.65	61.04		0.1%		23.5	46%	38%	37.6	0.1%		23.5	46%	38%	37.6	0.1%		23.5	46%	38%	37.5
Providence	Franklin Square #11	T2	115	11.5	51.24	56.69		0.1%		16.8	33%	30%	39.9	0.1%		16.8	33%	30%	39.9	0.1%		16.8	33%	30%	39.9
Providence	Franklin Square #11	T3	115	11.5	51.24	56.69		0.1%		29.0	57%	51%	27.7	0.1%		29.1	57%	51%	27.6	0.1%		29.1	57%	51%	27.6
Providence	Geneva #71	T1	23	4.16	11.54	14.19		0.1%		8.5	74%	60%	5.7	0.1%		8.5	74%	60%	5.6	0.1%		8.6	74%	60%	5.6
Providence	Harris Avenue #12	T1	23	4.16	11.48	12.72		0.1%		4.7	41%	37%	8.0	0.1%		4.7	41%	37%	8.0	0.1%		4.8	41%	37%	8.0
Providence	Harris Avenue #12	T2	23	4.16	9.06	11.52		0.1%		2.5	27%	22%	9.0	0.1%		2.5	27%	22%	9.0	0.1%		2.5	27%	22%	9.0
Providence	Huntington Park #67	T1	23	4.16	3	3		0.1%		2.0	67%	67%	1.0	0.1%		2.0	67%	67%	1.0	0.1%		2.0	67%	67%	1.0
Providence	Knightsville #66	T1	22.9	4.16	10.48	11.02		0.1%		6.7	64%	61%	4.3	0.1%		6.7	64%	61%	4.3	0.1%		6.7	64%	61%	4.3
Providence	Knightsville #66	T2	22.9	4.16	10.48	11.02		0.1%		4.6	44%	42%	6.4	0.1%		4.6	44%	42%	6.4	0.1%		4.6	44%	42%	6.4
Providence	Lippitt Hill #79	T1	22.9	12.47	25.11	27.54		0.1%		7.8	31%	28%	19.8	0.1%		7.8	31%	28%	19.8	0.1%		7.8	31%	28%	19.8
Providence	Lippitt Hill #79	T2	22.9	12.47	25.11	27.54		0.1%		9.0	36%	33%	18.5	0.1%		9.0	36%	33%	18.5	0.1%		9.0	36%	33%	18.5
Providence	Olneyville #6	T1	11.5	4.16	11.8	13.02		0.1%		4.9	42%	38%	8.1	0.1%		4.9	42%	38%	8.1	0.1%		4.9	42%	38%	8.1
Providence	Olneyville #6	T3	11.5	4.16	11.8	13.02		0.1%		3.3	28%	25%	9.7	0.1%		3.3	28%	25%	9.7	0.1%		3.3	28%	25%	9.7
Providence	Point Street #76	T1	115	12.47	77	89.8		0.1%		35.0	45%	39%	54.8	0.1%		35.0	46%	39%	54.8	0.1%		35.1	46%	39%	54.7
Providence	Point Street #76	T2	115	12.47	70.86	79.98		0.1%		36.4	51%	45%	43.6	0.1%		36.4	51%	46%	43.6	0.1%		36.5	51%	46%	43.5
Providence	Rochambeau Ave #37	T1	22.9	4.16	11.96	13.12		0.1%		5.3	45%	41%	7.8	0.1%		5.3	45%	41%	7.8	0.1%		5.3	45%	41%	7.8
Providence	Rochambeau Ave #37	T2	11.45	4.16	11.02	13.04		0.1%		3.6	33%	28%	9.4	0.1%		3.6	33%	28%	9.4	0.1%		3.6	33%	28%	9.4
Providence	South Street #1	24	11.5	23	9.1	10.23		0.1%		6.1	68%	60%	4.1	0.1%		6.1	68%	60%	4.1	0.1%		6.2	68%	60%	4.1
Providence	South Street #1	2201	11.5	23	9.1	10.23		0.1%		3.5	38%	34%	6.8	0.1%		3.5	38%	34%	6.8	0.1%		3.5	38%	34%	6.8
Providence	South Street #1	2216	11.5	23	10	10		0.1%		4.2	42%	42%	5.8	0.1%		4.2	42%	42%	5.8	0.1%		4.3	43%	43%	5.7
Providence	South Street #1	2248	11.5	23	12.81	14.33		0.1%		8.3	65%	58%	6.1	0.1%		8.3	65%	58%	6.1	0.1%		8.3	65%	58%	6.0
Providence	South Street #1	T1	115	11.5	66.34	78.75		0.1%		32.4	49%	41%	46.4	0.1%		32.4	49%	41%	46.3	0.1%		32.5	49%	41%	46.3
Providence	South Street #1	T2	115	11.5	66.78	77.14		0.1%		25.7	38%	33%	51.5	0.1%		25.7	39%	33%	51.4	0.1%		25.7	39%	33%	51.4
Providence	South Street #1	T3	115	11.5	72.69	91.22		0.1%		32.4	45%	36%	58.8	0.1%		32.4	45%	36%	58.8	0.1%		32.5	45%	36%	58.8
Providence	Sprague St. #36	T1	23	4.16	10.58	11.85		0.1%		2.8	26%	24%	9.1	0.1%		2.8	26%	24%	9.1	0.1%		2.8	26%	24%	9.0
Providence	Sprague St. #36	T2	23	4.16	10.79	12		0.1%		3.3	30%	27%	8.7	0.1%		3.3	30%	27%	8.7	0.1%		3.3	30%	27%	8.7
South County East	BONNET 42	2	34.5	12.47	11.3	12.2		1.8%		12.9	114%	106%	-0.7	1.8%		13.1	116%	107%	-0.9	1.7%		13.4	118%	110%	-1.2
South County East	DAVISVILLE 84	1	115	34.5	45.3	52.1		1.8%		24.1	53%	46%	28.0	1.8%		24.6	54%	47%	27.5	1.7%		25.0	55%	48%	27.1
South County East	DAVISVILLE 84	2A	115	34.5	45.1	51.8		1.8%		29.3	65%	57%	22.5	1.8%		29.8	66%	58%	22.0	1.7%		30.3	67%	58%	21.5
South County East	LAFAYETTE 30	1	34.5	12.47	7.6	8.6		1.8%		6.8	90%	79%	1.8	1.8%		6.9	91%	80%	1.7	1.7%		7.1	93%	83%	1.5
South County East	LAFAYETTE 30	2	34.5	12.47	12.3	13.2		1.8%		11.7	95%	89%	1.5	1.8%		12.0	97%	91%	1.2	1.7%		12.2	99%	92%	1.0
South County East	OLD BAPTIST ROAD 46	1	115	12.47	48.7	54.4		1.8%		24.6	51%	45%	29.8	1.8%		25.0	51%	46%	29.4	1.7%		25.5	52%	47%	28.9
South County East	OLD BAPTIST ROAD 46	2	115	12.47	48.9	51.9		1.8%		25.1	51%	48%	26.8	1.8%		25.6	52%	49%	26.3	1.7%		26.0	53%	50%	25.9
South County East	PEACEDALE 59	1	34.5	12.47	24.2	27.2		1.8%		16.6	69%	61%	10.6	1.8%		16.9	70%	62%	10.3	1.7%		17.2	71%	63%	10.0
South County East	PEACEDALE 59	2	34.5	12.47	24.2	27.2		1.8%		13.4	55%	49%	13.8	1.8%		13.6	56%	50%	13.6	1.7%		13.9	57%	51%	13.3
South County East	QUONSET 83	1	34.5	12.47	25.6	26.7		1.8%		20.6	80%	77%	6.1	1.8%		20.9	82%	78%	5.8	1.7%		21.3	83%	80%	5.4
South County East	TOWER HILL 88	1	115	12.47	50.0	60.0		1.8%		44.6	89%	74%	15.4	1.8%		45.4	91%	76%	14.6	1.7%		46.2	92%	77%	13.8
South County East	WAKEFIELD 17	4	34.5	12.47	12.9	13.5		1.8%		10.7	83%	79%	2.8	1.8%		10.9	85%	81%	2.6	1.7%		11.1	86%	82%	2.4
South County East	WAKEFIELD 17	3T	34.5	12.47	12.9	13.5		1.8%		13.9	108%	103%	-0.4	1.8%		14.1	110%	104%	-0.6	1.7%		14.4	111%	107%	-0.9
South County East	WAKEFIELD 17	5T	34.5	12.47	12.9	13.5		1.8%		12.9	100%	96%	0.6	1.8%		13.1	101%	97%	0.4	1.7%		13.3	103%	99%	0.2
South County East	WEST KINGSTON 62	1	115	34.5	43.9	55.7		1.8%		33.8	77%	61%	21.9	1.8%		34.4	78%	62%	21.3	1.7%		34.9	79%	63%	20.8
South County East	WEST KINGSTON 62	2	115	34.5	75.8	93.5		1.8%		50.7	67%	54%	42.8	1.8%		51.6	68%	55%	41.9	1.7%		52.4	69%	56%	41.1
South County West	ASHAWAY 43	1	34.5	12.47	8.4	9.1	Planned retire 2014 (Hopkinton related)																		
South County West	HOPE VALLEY 41	1	34.5	12.47	7.3	9.3	Planned retire 2014 (Hopkinton related)																		
South County West	HOPKINTON	1	115	12.47	50.0	55.0	Expected in-service 2014	1.8%		35.7	71%	65%	19.3	1.8%		36.3	73%	66%	18.7	1.7%		37.0	74%	67%	18.0
South County West	HOPKINTON	2	115	12.47	50.0	55.0	Expected in-service 2014	1.8%		31.0	62%	56%	24.0	1.8%		31.5	63%	57%	23.5	1.7%		32.1	64%	58%	22.9
South County West	KENYON 68	1	115	12.47	49.7	53.7		1.8%		27.2	55%	51%	26.5	1.8%		27.7	56%	52%	26.0	1.7%		28.2	57%	53%	25.5
South County West	KENYON 68	2	115	12.47	49.7	53.7		1.8%		21.4	43%	40%	32.3	1.8%		21.8	44%	41%	31.9	1.7%		22.2	45%	41%	31.5
South County West	LANGWORTHY 86	1	34.5	12.47	8.2	9.3	Planned retire 2014 (Hopkinton related)																		
South County West	LANGWORTHY 86	1	34.5	12.47	12.0	14.0	Expected in-service 2014	1.8%		12.0	100%	86%	2.0	1.8%		12.2	102%	87%	1.8	1.7%		12.4	104%	89%	1.6
South County West	WESTERLY 16	2	34.5	12.47	25.6	26.7	Planned retire 2014 (Hopkinton related)																		
South County West	WESTERLY 16	4	34.5	12.47	25.6	26.7	Planned retire 2014 (Hopkinton related)																		
South County West	WOOD RIVER 85	10	115	34.5	48.2	52.4		1.8%		4.2	9%	8%	48.2	1.8%		4.3	9%	8%	48.1	1.7%		4.4	9%	8%	48.0
South County West	WOOD RIVER 85	20	115	34.5	91.2	106.6		1.8%		18.6	20%	17%	88.0	1.8%		19.0	21%	18%	87.6	1.7%		19.3	21%	18%	87.3
Tiverton	TIVERTON 33	1	115	12.47	33.4	33.0		0.1%		16.2	48%	49%	16.9			16.2	48%	49%	16.9			16.2	49%	49%	16.8
Tiverton	TIVERTON 33	2	115	12.47	49.4	53.7		0.1%		17.8	36%	33%	35.9			17.9	36%	33%	35.9			17.9	36%	33%	35.8

Transformers - Normal Configuration Summary
2012 Annual Plan for Rhode Island

			System Voltage (kV)		Rating (MVA)			2026						2027						2028					
Study Area	Substation	Tranf. ID.	From	To	SN	SE	Comments	Growth	Spot	MVA	% SN	% SE	N-1 Capacity	Growth	Spot	MVA	% SN	% SE	N-1 Capacity	Growth	Spot	MVA	% SN	% SE	N-1 Capacity
Blackstone Valley North	Farnum #105	T1	115	23	37.3	37.3		0.1%		4.1	11%	11%	33.2	0.1%		4.1	11%	11%	33.2	0.1%		4.1	11%	11%	33.2
Blackstone Valley North	Highland Dr	T1	115	13.8	53	62	Estimated in-service 2014	0.1%		20.9	40%	34%	41.1	0.1%		21.0	40%	34%	41.0	0.1%		21.0	40%	34%	41.0
Blackstone Valley North	Highland Dr	T2	115	13.8	53	62	Estimated in-service 2014	0.1%		21.0	40%	34%	41.0	0.1%		21.1	40%	34%	40.9	0.1%		21.1	40%	34%	40.9
Blackstone Valley North	Nasonville #127	T271	115	13.8	47.8	47.8		0.1%		31.1	65%	65%	16.7	0.1%		31.2	65%	65%	16.6	0.1%		31.2	65%	65%	16.6
Blackstone Valley North	Riverside #108	T81	115	13.8	41.83	45.23		0.1%		21.3	51%	47%	23.9	0.1%		21.3	51%	47%	23.9	0.1%		21.4	51%	47%	23.9
Blackstone Valley North	Riverside #108	T82	115	13.8	49.62	58.74		0.1%		25.7	52%	44%	33.0	0.1%		25.7	52%	44%	33.0	0.1%		25.7	52%	44%	33.0
Blackstone Valley North	Staples #112	T124	115	13.8	47.8	47.8		0.1%		27.3	57%	57%	20.5	0.1%		27.3	57%	57%	20.5	0.1%		27.3	57%	57%	20.5
Blackstone Valley North	West Farnum	T1	115	13.8	20	20	Retire 2012																		
Blackstone Valley North	Woonsocket	T1	115	13.8	47.8	50	In-Service 2012	0.1%		26.2	55%	52%	23.8	0.1%		26.2	55%	52%	23.8	0.1%		26.2	55%	52%	23.8
Blackstone Valley South	Central Falls #104	North (J5 & J7)	13.8	4.16	3	3		0.1%		2.4	82%	82%	0.6	0.1%		2.4	82%	82%	0.6	0.1%		2.5	82%	82%	0.5
Blackstone Valley South	Central Falls #104	South (J1 & J3)	13.8	4.16	3.12	3.12		0.1%		1.5	47%	47%	1.6	0.1%		1.5	47%	47%	1.6	0.1%		1.5	48%	48%	1.6
Blackstone Valley South	Centre Street #106	(J1, J3, J7)	13.8	4.16	3.1	3.1		0.1%		2.5	80%	80%	0.6	0.1%		2.5	80%	80%	0.6	0.1%		2.5	80%	80%	0.6
Blackstone Valley South	Cottage St #109	(J1, J3, J5)	13.8	4.16	8.25	9.43		0.1%		6.4	78%	68%	3.0	0.1%		6.5	78%	68%	3.0	0.1%		6.5	78%	69%	3.0
Blackstone Valley South	Crossman St #111	(J1 & J3)	13.8	4.16	8.26	9.44		0.1%		3.2	39%	34%	6.2	0.1%		3.3	39%	34%	6.2	0.1%		3.3	39%	34%	6.2
Blackstone Valley South	Daggett Ave #113	(J1 & J2)	13.8	4.16	4.23	5.02		0.1%		2.2	52%	44%	2.8	0.1%		2.2	52%	44%	2.8	0.1%		2.2	52%	44%	2.8
Blackstone Valley South	Front #24	J1	13.8	4.16	3.1	3.1		0.1%		1.2	38%	38%	1.9	0.1%		1.2	38%	38%	1.9	0.1%		1.2	38%	38%	1.9
Blackstone Valley South	Hyde Avenue #28	(J1 & J2)	13.8	4.16	5.25	5.25		0.1%		2.0	39%	39%	3.2	0.1%		2.1	39%	39%	3.2	0.1%		2.1	39%	39%	3.2
Blackstone Valley South	Lee St. #30	(J1, J3, J5)	13.8	4.16	7	7		0.1%		5.0	72%	72%	2.0	0.1%		5.0	72%	72%	2.0	0.1%		5.0	72%	72%	2.0
Blackstone Valley South	Pawtucket No.1 #107	T71	115	13.8	48	48		0.1%		27.7	58%	58%	20.3	0.1%		27.8	58%	58%	20.2	0.1%		27.8	58%	58%	20.2
Blackstone Valley South	Pawtucket No.1 #107	T73A	115	13.8	48	48		0.1%		41.2	86%	86%	6.8	0.1%		41.3	86%	86%	6.7	0.1%		41.3	86%	86%	6.7
Blackstone Valley South	Pawtucket No.1 #107	T74	115	13.8	48	48		0.1%		30.3	63%	63%	17.7	0.1%		30.3	63%	63%	17.7	0.1%		30.4	63%	63%	17.6
Blackstone Valley South	Pawtucket No.2 #148	T1	13.8	4.16	7.6	9.36		0.1%		2.1	27%	22%	7.3	0.1%		2.1	27%	22%	7.3	0.1%		2.1	27%	22%	7.3
Blackstone Valley South	Pawtucket No.2 #148	T2	13.8	4.16	7.6	9.36		0.1%		3.2	42%	34%	6.2	0.1%		3.2	42%	34%	6.2	0.1%		3.2	42%	34%	6.2
Blackstone Valley South	Southeast #60		13.8	4.16	7	7		0.1%		2.4	34%	34%	4.6	0.1%		2.4	34%	34%	4.6	0.1%		2.4	34%	34%	4.6
Blackstone Valley South	Valley #102	T21	115	13.8	38.36	45.95		0.1%		23.6	62%	51%	22.3	0.1%		23.7	62%	51%	22.3	0.1%		23.7	62%	52%	22.3
Blackstone Valley South	Valley #102	T22	115	13.8	31.6	40.29		0.1%		20.2	64%	50%	20.1	0.1%		20.2	64%	50%	20.1	0.1%		20.2	64%	50%	20.1
Blackstone Valley South	Valley #102	T23	115	24	42.01	51.51		0.1%		3.9	9%	8%	47.6	0.1%		3.9	9%	8%	47.6	0.1%		3.9	9%	8%	47.6
Blackstone Valley South	Washington #126	T261	115	13.8	48	48		0.1%		26.2	55%	55%	21.8	0.1%		26.3	55%	55%	21.7	0.1%		26.3	55%	55%	21.7
Blackstone Valley South	Washington #126	T262	115	13.8	59.27	57.4		0.1%		25.4	43%	44%	32.0	0.1%		25.5	43%	44%	31.9	0.1%		25.5	43%	44%	31.9
Central RI East	APPONAUG 3	3	23	12.47	15.5	19.6		1.7%		11.6	75%	59%	8.0	1.7%		11.8	76%	60%	7.8	1.7%		12.0	77%	61%	7.6
Central RI East	APPONAUG 3	4	23	12.47	11.9	12.6		1.7%		11.2	94%	89%	1.4	1.7%		11.4	95%	90%	1.2	1.7%		11.6	97%	92%	1.0
Central RI East	AUBURN 73	1	23	4.16	10.6	11.8		1.7%		6.8	64%	58%	5.0	1.7%		6.9	66%	59%	4.9	1.7%		7.0	67%	60%	4.8
Central RI East	AUBURN 73	2	23	4.16	9.7	10.6		1.7%		4.6	47%	43%	6.1	1.7%		4.6	48%	44%	6.0	1.7%		4.7	49%	44%	5.9
Central RI East	DRUMROCK 14	3	115	23/12.47	53.0	76.0		1.7%		42.6	80%	56%	33.4	1.7%		43.4	82%	57%	32.7	1.7%		43.4	82%	57%	32.7
Central RI East	DRUMROCK 14	4	115	23	89.0	107.4		1.7%		57.6	65%	54%	49.8	1.7%		58.6	66%	55%	48.8	1.7%		58.6	66%	55%	48.8
Central RI East	DRUMROCK 14	5	115	23/12.47	107.0	107.0		1.7%		80.3	75%	75%	26.7	1.7%		81.7	76%	76%	25.3	1.7%		81.7	76%	76%	25.3
Central RI East	KILVERT STREET 86	1	115	12.47	67.0	84.0	Expected In-Service 2015	1.7%		31.7	47%	38%	52.3	1.7%		32.3	48%	38%	51.7	1.7%		32.8	49%	39%	51.2
Central RI East	KILVERT STREET 87	2	115	12.47	67.0	84.0		1.7%		23.9	36%	28%	60.1	1.7%		24.3	36%	29%	59.7	1.7%		24.7	37%	29%	59.3
Central RI East	LAKEWOOD 57	1	23	4.16	10.1	10.6		1.7%		8.6	85%	81%	2.1	1.7%		8.7	86%	82%	1.9	1.7%		8.9	88%	83%	1.8
Central RI East	LAKEWOOD 57	2	23	4.16	10.2	11.5		1.7%		2.6	26%	23%	8.8	1.7%		2.7	26%	23%	8.8	1.7%		2.7	27%	24%	8.7
Central RI East	LINCOLN AVENUE 72	1	115	12.47	52.1	54.9		1.7%		31.2	60%	57%	23.7	1.7%		31.8	61%	58%	23.2	1.7%		32.3	62%	59%	22.6
Central RI East	LINCOLN AVENUE 72	2	115	12.47	52.1	54.9		1.7%		34.1	66%	62%	20.8	1.7%		34.7	67%	63%	20.2	1.7%		35.3	68%	64%	19.6
Central RI East	PAWTUXET 31	1	23	4.16	4.3	5.1	Planned retire 2015																		
Central RI East	PONTIAC 27	1	115	12.47	50.7	53.3		1.7%		29.1	57%	55%	24.2	1.7%		29.6	58%	55%	23.7	1.7%		30.1	59%	56%	23.2
Central RI East	PONTIAC 27	2	115	12.47	46.5	51.9		1.7%		36.2	78%	70%	15.7	1.7%		36.8	79%	71%	15.1	1.7%		37.5	81%	72%	14.4
Central RI East	SOCKANOSSET 24	1	115	23	50.3	56.8		1.7%		38.5	77%	68%	18.3	1.7%		39.1	78%	69%	17.7	1.7%		39.1	78%	69%	17.7
Central RI East	SOCKANOSSET 24	2	115	23	50.4	57.0		1.7%		35.1	70%	62%	21.9	1.7%		35.7	71%	63%	21.3	1.7%		35.7	71%	63%	21.3
Central RI East	WARWICK 52	1	23	12.47	11.6	12.7		0.5%		9.1	78%	72%	3.6	0.5%		9.1	79%	72%	3.6	0.5%		9.2	79%	72%	3.5
Central RI East	WARWICK 52	4	23	12.47	12.0	12.0		0.5%		9.6	80%	80%	2.4	0.5%		9.7	80%	80%	2.3	0.5%		9.7	81%	81%	2.3
Central RI West	ANTHONY	1	23	12.47	7.8	8.1		0.5%		5.4	70%	67%	2.7	0.5%		5.5	70%	68%	2.6	0.5%		5.5	70%	68%	2.6
Central RI West	ANTHONY	2	23	12.47	7.8	8.1		0.5%		5.0	65%	62%	3.1	0.5%		5.1	65%	63%	3.0	0.5%		5.1	65%	63%	3.0
Central RI West	ARCTIC	1	23	4.16	5.0	5.0		0.5%		3.6	72%	72%	1.4	0.5%		3.6	73%	72%	1.4	0.5%		3.7	73%	74%	1.3
Central RI West	ARCTIC	2	23	4.16	6.7	7.4		0.5%		0.3	4%	4%	7.1	0.5%		0.3	4%	4%	7.1	0.5%		0.3	4%	4%	7.1
Central RI West	COVENTRY	1	23	12.47	11.4	13.5		0.5%		10.8	95%	80%	2.7	0.5%		10.8	95%	80%	2.7	0.5%		10.9	96%	81%	2.6
Central RI West	COVENTRY MITS	1	34.5	12.47	13.0	14.0	In-Service 2013	0.5%		10.5	81%	75%	3.5	0.5%		10.6	81%	76%	3.4	0.5%		10.6	82%	76%	3.4
Central RI West	DIVISION ST	1	34.5	12.47	23.7	27.6		0.5%		17.0	72%	62%	10.6	0.5%		17.1	72%	62%	10.5	0.5%		17.2	72%	62%	10.4
Central RI West	DIVISION ST	2	34.5	12.47	23.7	27.6		0.5%		11.0	47%	40%	16.6	0.5%		11.1	47%	40%	16.5	0.5%		11.1	47%	40%	16.5
Central RI West	HOPE	1	23	12.47	7.5	8.5		0.5%		5.1	68%	60%	3.4	0.5%		5.1	68%	60%	3.4	0.5%		5.2	68%	61%	3.3
Central RI West	HOPE	2*	23	12.47	13.7	16.5		0.5%		9.0	66%	55%	7.5	0.5%		9.1	66%	55%	7.4	0.5%		9.1	67%	55%	7.4
Central RI West	HOPKINS HILL	1*	34.5	12.47	48.8	51.0		0.5%		22.5	46%	44%	28.5	0.5%		22.6	46%	44%	28.4	0.5%		22.7	46%	45%	28.3
Central RI West	HOPKINS HILL	2*	34.5	12.47	49.2	52.0		0.5%		32.6	66%	63%	19.4	0.5%		32.8	67%	63%	19.2	0.5%		33.0	67%	63%	19.0
Central RI West	HUNT RIVER	2	34.5	12.47	11.2	12.7	Planned retire 2017 - Flood Mitigation																		
Central RI West	KENT COUNTY	5	115	12.47	50.0	58.0	Expected In-Service 2017	0.5%		29.0	58%	50%	29.0	0.5%		29.1	58%	50%	28.9	0.5%		29.3	59%	51%	28.7
Central RI West	KENT COUNTY	6	115	12.47	50.7	58.9		0.5%		17.1	34%	29%	41.8	0.5%		17.2	34%	29%	41.7	0.5%		17.3	34%	29%	41.6
Central RI West	KENT COUNTY	1*	115	34.5	57.3	67.6		0.5%		37.9	66%	56%	29.7	0.5%		38.1	67%	56%	29.5	0.5%		38.3	67%	57%	29.3
Central RI West	KENT COUNTY	2*	115	34.5	66.3	69.9		0.5%		39.6	60%	57%	30.3	0.5%		39.8	60%	57%	30.1	0.5%		39.9	60%	57%	30.0
Central RI West	KENT COUNTY	7*	115	34.5	57.3	68.8		0.5%		37.1	65%	54%	31.7	0.5%		37.3	65%	54%	31.5	0.5%		37.5	65%	55%	31.3
Central RI West	NATICK	1	23	12.47	13.2	14.3		0.5%		9.0	68%	63%	5.3	0.5%		9.0	69%	63%	5.3	0.5%		9.1	69%	64%	5.2
Central RI West	NATICK	2	23	12.47	13.5	14.5		0.5%		7.4	55%	51%	7.1	0.5%		7.4	55%	51%	7.1	0.5%		7.4	55%	51%	7.1
Central RI West	WARWICK MALL	1	23	12.47	8.8	8.9		0.5%		4.8	55%	54%	4.1	0.5%		4.8	55%	54%	4.1	0.5%		4.9	55%	55%	4.0
Central RI West	WARWICK MALL	2	23	12.47	8.7	9.1		0.5%		3.2	37%	35%	5.9	0.5%		3.2	37%	35%	5.9	0.5%		3.2	37%	35%	5.9

Transformers - Normal Configuration Summary
2012 Annual Plan for Rhode Island

			System Voltage (kV)		Rating (MVA)			2026						2027						2028					
Study Area	Substation	Tranf. ID.	From	To	SN	SE	Comments	Growth	Spot	MVA	% SN	% SE	N-1 Capacity	Growth	Spot	MVA	% SN	% SE	N-1 Capacity	Growth	Spot	MVA	% SN	% SE	N-1 Capacity
Central RI West	NEW LONDON AVE	1	115	12.47	55.0	60.0	Expected In-Service 2015	0.5%		28.6	52%	48%	31.4	0.5%		28.7	52%	48%	31.3	0.5%		28.8	52%	48%	31.2
East Bay	BARRINGTON 4	1	23	12.47	35.19	35.09		0.1%		21.0	60%	60%	14.1	0.1%		21.0	60%	60%	14.1	0.1%		21.0	60%	60%	14.1
East Bay	BRISTOL 51	1	115	12.47	56.9	63.4		0.1%		19.9	35%	31%	43.5	0.1%		19.9	35%	31%	43.5	0.1%		20.0	35%	31%	43.4
East Bay	BRISTOL 51	2	23	12.47	25.1	29.8		0.1%		10.1	40%	34%	19.7	0.1%		10.1	40%	34%	19.7	0.1%		10.1	40%	34%	19.7
East Bay	KENT CORNERS 47	T1	23	4.16	7.14	7.53		0.1%		2.9	40%	38%	4.6	0.1%		2.9	40%	38%	4.6	0.1%		2.9	40%	38%	4.6
East Bay	KENT CORNERS 47	T2	23	4.16	6.82	8.07		0.1%		4.7	69%	58%	3.4	0.1%		4.7	69%	58%	3.4	0.1%		4.7	69%	58%	3.4
East Bay	PHILLIPSDALE 20	T1	115	23	56	56		0.1%		11.3	20%	20%	44.7	0.1%		11.3	20%	20%	44.7	0.1%		11.3	20%	20%	44.7
East Bay	PHILLIPSDALE 20	T2	115	23	45.32	56.75		0.1%		8.5	19%	15%	48.3	0.1%		8.5	19%	15%	48.3	0.1%		8.5	19%	15%	48.3
East Bay	PHILLIPSDALE 20	T3	23	12.47	25.16	28.87		0.1%		13.4	53%	46%	15.5	0.1%		13.4	53%	46%	15.5	0.1%		13.4	53%	46%	15.5
East Bay	WAMPANOAG 48	T1	115	12.47	42.83	52.72		0.1%		30.5	71%	58%	22.2	0.1%		30.5	71%	58%	22.2	0.1%		30.6	71%	58%	22.2
East Bay	WAMPANOAG 48	T2	115	12.47	52.36	55.33		0.1%		27.8	53%	50%	27.6	0.1%		27.8	53%	50%	27.5	0.1%		27.8	53%	50%	27.5
East Bay	WARREN 5	5	115	23	60.96	65.05		0.1%		8.6	14%	13%	56.5	0.1%		8.6	14%	13%	56.5	0.1%		8.6	14%	13%	56.5
East Bay	WARREN 5	6	115	23	59.6	64.17		0.1%		22.3	37%	35%	41.9	0.1%		22.3	37%	35%	41.9	0.1%		22.3	37%	35%	41.9
East Bay	WARREN 5	T1	115	12.47	48.28	53.43		0.1%		14.8	31%	28%	38.6	0.1%		14.8	31%	28%	38.6	0.1%		14.9	31%	28%	38.6
East Bay	WARREN 5	T2	115	12.47	50.62	59.57		0.1%		18.6	37%	31%	41.0	0.1%		18.6	37%	31%	40.9	0.1%		18.7	37%	31%	40.9
East Bay	WATERMAN AVENUE 78	T1	23	12.47	16.36	18.26		0.1%		7.7	47%	42%	10.6	0.1%		7.7	47%	42%	10.6	0.1%		7.7	47%	42%	10.6
East Bay	WATERMAN AVENUE 78	T2	23	12.47	16.36	18.26		0.1%		6.4	39%	35%	11.9	0.1%		6.4	39%	35%	11.8	0.1%		6.4	39%	35%	11.8
Newport	Bailey Brook	191	23	4.16	8.3	8.7	Planned retire 2015 (Newport related)																		
Newport	Bailey Brook	192	23	4.16	8.6	10.4	Planned retire 2015 (Newport related)																		
Newport	Clarke St	651	23	4.16	4.1	4.3	Planned Upgrade 2015	1.5%		3.8	94%	88%	0.5	1.5%		3.9	95%	91%	0.4	1.5%		3.9	97%	91%	0.4
Newport	Clarke St	652	23	4.16	4.5	5.0		1.5%		3.5	77%	70%	1.5	1.5%		3.5	79%	70%	1.5	1.5%		3.6	80%	72%	1.4
Newport	Dexter	361	115	69	121.0	130.0		1.5%		91.1	75%	70%	38.9	1.5%		92.5	76%	71%	37.5	1.5%		93.9	78%	72%	36.1
Newport	Dexter	362	115	69	61.0	65.0		1.5%		39.3	64%	60%	25.7	1.5%		39.9	65%	61%	25.1	1.5%		40.4	66%	62%	24.6
Newport	Dexter	363	115	69	61.0	65.0		1.5%		39.3	64%	60%	25.7	1.5%		39.9	65%	61%	25.1	1.5%		40.4	66%	62%	24.6
Newport	Dexter	364	115	13.8	44.6	47.4		1.5%		33.3	75%	70%	14.1	1.5%		33.8	76%	71%	13.6	1.5%		34.3	77%	72%	13.1
Newport	Eldred	451	23	4.16	7.9	9.6	Planned retire 2015																		
Newport	Eldred NEW	1	23	4.16	5.8	7.0	Expected in-service 2015	1.5%		3.3	57%	47%	3.7	1.5%		3.3	57%	47%	3.7	1.5%		3.4	58%	49%	3.6
Newport	Eldred NEW	2	23	4.16	5.8	7.0	Expected in-service 2015	1.5%		2.5	44%	36%	4.5	1.5%		2.6	44%	37%	4.4	1.5%		2.6	45%	37%	4.4
Newport	Gate 2	381	69	23	54.2	63.7		1.5%		20.8	38%	33%	42.9	1.5%		21.9	40%	34%	41.8	1.5%		22.3	41%	35%	41.4
Newport	Gate 2	382	69	23	55.0	60.0	Expected in-service 2015	1.5%		20.8	38%	35%	39.2	1.5%		21.9	40%	37%	38.1	1.5%		22.3	40%	37%	37.7
Newport	Gate 2	731	23	4.16	8.1	8.7	Planned retire 2015 (Newport related)																		
Newport	Harrison	321	23	4.16	8.3	9.7		1.5%		3.3	40%	34%	6.4	1.5%		3.4	41%	35%	6.3	1.5%		3.4	41%	35%	6.3
Newport	Harrison	322	23	4.16	8.1	10.1		1.5%		6.1	76%	60%	4.0	1.5%		6.2	77%	61%	3.9	1.5%		6.3	78%	62%	3.8
Newport	Hospital	461	23	4.16	4.1	4.3		1.5%		3.1	77%	72%	1.2	1.5%		3.2	78%	74%	1.1	1.5%		3.2	79%	74%	1.1
Newport	Hospital	462	23	4.16	4.1	4.3		1.5%		2.5	62%	58%	1.8	1.5%		2.6	63%	60%	1.7	1.5%		2.6	64%	60%	1.7
Newport	Jepson	341	23	4.16	9.7	10.4	Planned retire 2015 (Newport related)																		
Newport	Jepson	371	69	23	16.5	18.5		1.5%		6.7	40%	36%	11.8	1.5%		6.8	41%	37%	11.7	1.5%		6.9	42%	37%	11.6
Newport	Jepson	372	69	23	23.2	24.8		1.5%		12.2	52%	49%	12.6	1.5%		12.3	53%	50%	12.5	1.5%		12.5	54%	50%	12.3
Newport	Jepson	373	69	23	48.9	57.9		1.5%		26.2	54%	45%	31.7	1.5%		26.6	54%	46%	31.3	1.5%		27.0	55%	47%	30.9
Newport	Jepson	374	69	13.8	42.9	48.6		1.5%		27.0	63%	56%	21.6	1.5%		27.4	64%	56%	21.2	1.5%		27.8	65%	57%	20.8
Newport	Jepson	376	69	23	15.4	16.4		1.5%		7.5	49%	46%	8.9	1.5%		7.6	49%	46%	8.8	1.5%		7.7	50%	47%	8.7
Newport	Kingston	311	23	4.16	7.9	9.6		1.5%		6.0	76%	63%	3.6	1.5%		6.1	78%	64%	3.5	1.5%		6.2	79%	65%	3.4
Newport	Kingston	312	23	4.16	7.9	9.6		1.5%		4.9	61%	51%	4.7	1.5%		4.9	62%	51%	4.7	1.5%		5.0	63%	52%	4.6
Newport	Merton	511	23	4.16	2.2	2.4		1.5%		2.3	102%	96%	0.1	1.5%		2.3	104%	96%	0.1	1.5%		2.4	105%	100%	0.0
Newport	Merton	512	23	4.16	8.4	10.0		1.5%		5.9	70%	59%	4.1	1.5%		6.0	71%	60%	4.0	1.5%		6.1	72%	61%	3.9
Newport	Newport Sub	1	69	13.8	55.0	60.0	Expected in-service 2015	1.6%		21.7	39%	36%	38.3	1.6%		22.0	40%	37%	38.0	1.5%		22.4	41%	37%	37.6
Newport	Newport Sub	2	69	13.8	55.0	60.0	Expected in-service 2015	1.6%		20.3	37%	34%	39.7	1.6%		20.6	37%	34%	39.4	1.5%		20.9	38%	35%	39.1
Newport	No. Aquidneck	211	23	4.16	8.0	10.2		1.5%		4.3	53%	42%	5.9	1.5%		4.3	54%	42%	5.9	1.5%		4.4	55%	43%	5.8
Newport	So. Aquidneck	221	23	4.16	7.9	9.6		1.5%		5.4	69%	56%	4.2	1.5%		5.5	70%	57%	4.1	1.5%		5.6	71%	58%	4.0
Newport	Vernon Ave	231	23	4.16	3.6	3.9	Planned retire 2015 (Newport related)																		
Newport	Vernon Ave	232	23	4.16	3.6	3.9	Planned retire 2015 (Newport related)																		
Newport	West Howard	541	23	4.16	12.6	14.8		1.5%		9.9	79%	67%	4.9	1.5%		10.0	80%	68%	4.8	1.5%		10.2	81%	69%	4.6
Newport	West Howard	542	23	4.16	13.1	13.58		1.5%		7.1	54%	52%	6.5	1.5%		7.2	55%	53%	6.4	1.5%		7.3	56%	54%	6.3
North Central RI	Centerdale #50	T1	23	4.16	7.1	7.54		1.8%		4.1	58%	55%	3.4	1.8%		4.2	60%	56%	3.3	1.8%		4.3	61%	58%	3.2
North Central RI	Centerdale #50	T3	23	12.47	7.93	8.34		1.8%		6.7	84%	80%	1.7	1.8%		6.8	85%	81%	1.6	1.8%		6.9	87%	83%	1.4
North Central RI	Chopmist #34	T1	23	12.47	15.96	16.42		1.8%		11.4	72%	70%	5.0	1.8%		11.6	73%	71%	4.8	1.8%		11.8	74%	72%	4.6
North Central RI	Chopmist #34	T2	23	12.47	13.84	13.57		1.8%		9.3	67%	68%	4.3	1.8%		9.4	68%	69%	4.1	1.8%		9.6	69%	71%	4.0
North Central RI	Chopmist #34	T3	23	12.47	12.81	13.94		1.8%		8.2	64%	59%	5.7	1.8%		8.4	65%	60%	5.6	1.8%		8.5	66%	61%	5.4
North Central RI	Farnum Pike #23	T1	115	12.47	64.8	64.8		1.8%		23.4	36%	36%	41.4	1.8%		23.8	37%	37%	41.0	1.8%		24.2	37%	37%	40.6
North Central RI	Farnum Pike #23	T2	115	12.47	64.8	64.8		1.8%		32.0	49%	49%	32.8	1.8%		32.6	50%	50%	32.2	1.8%		33.1	51%	51%	31.7
North Central RI	Johnston #18	T1	115	12.47	25	35		1.8%		20.6	82%	59%	14.4	1.8%		21.0	84%	60%	14.0	1.8%		21.4	85%	61%	13.6
North Central RI	Johnston #18	T1 - 23	115	23	63.4	77		1.8%		28.3	45%	37%	48.7	1.8%		28.8	45%	37%	48.2	1.8%		29.3	46%	38%	47.7
North Central RI	Johnston #18	T3	115	12.47	53.68	56.33		1.8%		32.9	61%	58%	23.5	1.8%		33.5	62%	59%	22.9	1.8%		34.1	63%	60%	22.3
North Central RI	Johnston #18	T4	115	12.47	68.6	74		1.8%		25.8	38%	35%	48.2	1.8%		26.2	38%	35%	47.8	1.8%		26.7	39%	36%	47.3
North Central RI	Johnston #18	T2- 23	115	23	80	90		1.8%		46.3	58%	51%	43.7	1.8%		47.1	59%	52%	42.9	1.8%		47.9	60%	53%	42.1
North Central RI	Manton #69	T2	23	12.47	25.46	26.66		1.8%		21.5	84%	81%	5.2	1.8%		21.8	86%	82%	4.8	1.8%		22.2	87%	83%	4.4
North Central RI	Putnam Pike #38	T1	115	12.47	64.94	68.79		1.8%		32.8	51%	48%	36.0	1.8%		33.4	51%	49%	35.4	1.8%		34.0	52%	49%	34.8
North Central RI	Putnam Pike #38	T2	115	12.47	64.94	68.79		1.8%		27.6	43%	40%	41.1	1.8%		28.1	43%	41%	40.6	1.8%		28.6	44%	42%	40.1
North Central RI	Shun Pike #35	T1	115	12.47	68.6	74	Expected in-service 2018	1.8%		14.3	21%	19%	59.7	1.8%		14.6	21%	20%	59.4	1.8%		15.0	22%	20%	59.0
North Central RI	Shun Pike SIMS	T3	115	13.2	27	30	Expected in-service 2014	1.8%		14.3	53%	48%	15.7	1.8%		14.6	54%	49%	15.4	1.8%		15.0	56%	50%	15.0
North Central RI	West Cranston #21	T1	115	12.47	27.78	29.91		1.8%		10.4	37%	35%	19.5	1.8%		10.6	38%	35%	19.4	1.8%		10.7	39%	36%	19.2
North Central RI	West Cranston #21	T2	115	12.47	27.76	29.86		1.8%		24.2	87%	81%	5.7	1.8%		24.6	89%	82%	5.3	1.8%		25.0	90%	84%	4.8
North Central RI	West Greenville # 45	T3	23	12.47	11.91	13.56		1.8%		3.6	30%	26%	10.0	1.8%		3.6	30%	27%	9.9	1.8%		3.7	31%	27%	9.9
North Central RI	Wolf Hill #19	T1	115	23	65.01	69.83		1.8%		36.7	56%	53%	33.1	1.8%		37.4	58%	54%	32.4	1.8%		38.1	59%	55%	31.8
Providence	Admiral Street #9	T1	23	11/4.16	15	15		0.1%		2.8	19%	19%	12.2	0.1%		2.8	19%	19%	12.2	0.1%		2.9	19%	19%	12.1
Providence	Admiral Street #9	T2	23	11/4.16	15	15		0.1%		3.7	24%	24%	11.3	0.1%		3.7	24%	24%	11.3	0.1%		3.7	24%	24%	11.3
Providence	Admiral Street #9	T3	115	23	62.1	63.7		0.1%		23.5	38%	37%	40.2	0.1%		23.5	38%	37%	40.2	0.1%		23.6	38%	37%	40.1

Transformers - Normal Configuration Summary
2012 Annual Plan for Rhode Island

			System Voltage (kV)		Rating (MVA)			2026						2027						2028					
Study Area	Substation	Tranf. ID.	From	To	SN	SE	Comments	Growth	Spot	MVA	% SN	% SE	N-1 Capacity	Growth	Spot	MVA	% SN	% SE	N-1 Capacity	Growth	Spot	MVA	% SN	% SE	N-1 Capacity
Providence	Admiral Street #9	T4	115	23	63	64.9		0.1%		23.0	36%	35%	41.9	0.1%		23.0	36%	35%	41.9	0.1%		23.0	37%	35%	41.9
Providence	Admiral Street #9	T5	23	4.16	15.13	15.36		0.1%		6.1	40%	40%	9.2	0.1%		6.1	40%	40%	9.2	0.1%		6.1	40%	40%	9.2
Providence	Clarkson Street #13	T1	115	12.47	65.46	81.01		0.1%		37.4	57%	46%	43.6	0.1%		37.4	57%	46%	43.6	0.1%		37.4	57%	46%	43.6
Providence	Clarkson Street #13	T2	115	12.47	65.16	80.24		0.1%		35.7	55%	45%	44.5	0.1%		35.8	55%	45%	44.5	0.1%		35.8	55%	45%	44.4
Providence	Dyer St #2	T1	11.5	4.16	18.27	19.78		0.1%		8.2	45%	42%	11.6	0.1%		8.2	45%	42%	11.6	0.1%		8.2	45%	42%	11.6
Providence	Dyer St #2	T2	11.5	4.16	18.25	19.74		0.1%		5.5	30%	28%	14.3	0.1%		5.5	30%	28%	14.3	0.1%		5.5	30%	28%	14.3
Providence	East George St. #77	T1	23	4.16	12.59	15.27		0.1%		4.5	36%	29%	10.8	0.1%		4.5	36%	29%	10.8	0.1%		4.5	36%	29%	10.8
Providence	East George St. #77	T2	23	4.16	12.59	15.27		0.1%		4.9	39%	32%	10.4	0.1%		4.9	39%	32%	10.4	0.1%		4.9	39%	32%	10.4
Providence	Elmwood #7 (12.47 kV)	T2	23	12.47	40.58	45.78		0.1%		30.7	76%	67%	15.1	0.1%		30.7	76%	67%	15.0	0.1%		30.8	76%	67%	15.0
Providence	Franklin Square #11	2207	11.5	23	16.06	18.75		0.1%		7.3	45%	39%	11.5	0.1%		7.3	45%	39%	11.5	0.1%		7.3	45%	39%	11.5
Providence	Franklin Square #11	2210	11.5	23	17.14	15.85		0.1%		10.9	63%	69%	5.0	0.1%		10.9	63%	69%	5.0	0.1%		10.9	64%	69%	5.0
Providence	Franklin Square #11	2220	11.5	23	17.7	19.3		0.1%		15.7	89%	81%	3.6	0.1%		15.7	89%	81%	3.6	0.1%		15.7	89%	81%	3.6
Providence	Franklin Square #11	2260	11.5	23	16.06	18.75		0.1%		5.3	33%	28%	13.5	0.1%		5.3	33%	28%	13.5	0.1%		5.3	33%	28%	13.5
Providence	Franklin Square #11	3320	11.5	34.5	25.87	29.66		0.1%		7.8	30%	26%	21.8	0.1%		7.8	30%	26%	21.8	0.1%		7.9	30%	26%	21.8
Providence	Franklin Square #11	3324	11.5	34.5	25.75	29.5		0.1%		10.1	39%	34%	19.4	0.1%		10.1	39%	34%	19.4	0.1%		10.1	39%	34%	19.4
Providence	Franklin Square #11	T1	115	11.5	50.65	61.04		0.1%		23.5	46%	39%	37.5	0.1%		23.5	46%	39%	37.5	0.1%		23.6	47%	39%	37.5
Providence	Franklin Square #11	T2	115	11.5	51.24	56.69		0.1%		16.8	33%	30%	39.9	0.1%		16.8	33%	30%	39.9	0.1%		16.8	33%	30%	39.9
Providence	Franklin Square #11	T3	115	11.5	51.24	56.69		0.1%		29.1	57%	51%	27.6	0.1%		29.2	57%	51%	27.5	0.1%		29.2	57%	51%	27.5
Providence	Geneva #71	T1	23	4.16	11.54	14.19		0.1%		8.6	74%	60%	5.6	0.1%		8.6	74%	60%	5.6	0.1%		8.6	74%	60%	5.6
Providence	Harris Avenue #12	T1	23	4.16	11.48	12.72		0.1%		4.8	41%	37%	8.0	0.1%		4.8	41%	37%	8.0	0.1%		4.8	42%	37%	8.0
Providence	Harris Avenue #12	T2	23	4.16	9.06	11.52		0.1%		2.5	27%	22%	9.0	0.1%		2.5	28%	22%	9.0	0.1%		2.5	28%	22%	9.0
Providence	Huntington Park #67	T1	23	4.16	3	3		0.1%		2.0	67%	67%	1.0	0.1%		2.0	67%	67%	1.0	0.1%		2.0	67%	67%	1.0
Providence	Knightsville #66	T1	22.9	4.16	10.48	11.02		0.1%		6.7	64%	61%	4.3	0.1%		6.7	64%	61%	4.3	0.1%		6.7	64%	61%	4.3
Providence	Knightsville #66	T2	22.9	4.16	10.48	11.02		0.1%		4.6	44%	42%	6.4	0.1%		4.6	44%	42%	6.4	0.1%		4.6	44%	42%	6.4
Providence	Lippitt Hill #79	T1	22.9	12.47	25.11	27.54		0.1%		7.8	31%	28%	19.8	0.1%		7.8	31%	28%	19.8	0.1%		7.8	31%	28%	19.7
Providence	Lippitt Hill #79	T2	22.9	12.47	25.11	27.54		0.1%		9.0	36%	33%	18.5	0.1%		9.0	36%	33%	18.5	0.1%		9.0	36%	33%	18.5
Providence	Olneyville #6	T1	11.5	4.16	11.8	13.02		0.1%		4.9	42%	38%	8.1	0.1%		4.9	42%	38%	8.1	0.1%		4.9	42%	38%	8.1
Providence	Olneyville #6	T3	11.5	4.16	11.8	13.02		0.1%		3.3	28%	25%	9.7	0.1%		3.3	28%	25%	9.7	0.1%		3.3	28%	26%	9.7
Providence	Point Street #76	T1	115	12.47	77	89.8		0.1%		35.1	46%	39%	54.7	0.1%		35.2	46%	39%	54.6	0.1%		35.2	46%	39%	54.6
Providence	Point Street #76	T2	115	12.47	70.86	79.98		0.1%		36.5	51%	46%	43.5	0.1%		36.5	52%	46%	43.5	0.1%		36.6	52%	46%	43.4
Providence	Rochambeau Ave #37	T1	22.9	4.16	11.96	13.12		0.1%		5.4	45%	41%	7.8	0.1%		5.4	45%	41%	7.8	0.1%		5.4	45%	41%	7.8
Providence	Rochambeau Ave #37	T2	11.45	4.16	11.02	13.04		0.1%		3.6	33%	28%	9.4	0.1%		3.6	33%	28%	9.4	0.1%		3.6	33%	28%	9.4
Providence	South Street #1	24	11.5	23	9.1	10.23		0.1%		6.2	68%	60%	4.1	0.1%		6.2	68%	60%	4.1	0.1%		6.2	68%	60%	4.1
Providence	South Street #1	2201	11.5	23	9.1	10.23		0.1%		3.5	38%	34%	6.8	0.1%		3.5	38%	34%	6.8	0.1%		3.5	38%	34%	6.8
Providence	South Street #1	2216	11.5	23	10	10		0.1%		4.3	43%	43%	5.7	0.1%		4.3	43%	43%	5.7	0.1%		4.3	43%	43%	5.7
Providence	South Street #1	2248	11.5	23	12.81	14.33		0.1%		8.3	65%	58%	6.0	0.1%		8.3	65%	58%	6.0	0.1%		8.3	65%	58%	6.0
Providence	South Street #1	T1	115	11.5	66.34	78.75		0.1%		32.5	49%	41%	46.3	0.1%		32.5	49%	41%	46.2	0.1%		32.6	49%	41%	46.2
Providence	South Street #1	T2	115	11.5	66.78	77.14		0.1%		25.8	39%	33%	51.4	0.1%		25.8	39%	33%	51.4	0.1%		25.8	39%	33%	51.3
Providence	South Street #1	T3	115	11.5	72.69	91.22		0.1%		32.5	45%	36%	58.7	0.1%		32.5	45%	36%	58.7	0.1%		32.6	45%	36%	58.7
Providence	Sprague St. #36	T1	23	4.16	10.58	11.85		0.1%		2.8	27%	24%	9.0	0.1%		2.8	27%	24%	9.0	0.1%		2.8	27%	24%	9.0
Providence	Sprague St. #36	T2	23	4.16	10.79	12		0.1%		3.3	30%	27%	8.7	0.1%		3.3	30%	27%	8.7	0.1%		3.3	30%	27%	8.7
South County East	BONNET 42	2	34.5	12.47	11.3	12.2		1.7%		13.6	120%	111%	-1.4	1.7%		13.8	122%	113%	-1.6	1.7%		14.0	124%	115%	-1.8
South County East	DAVISVILLE 84	1	115	34.5	45.3	52.1		1.7%		25.4	56%	49%	26.7	1.7%		25.8	57%	50%	26.3	1.7%		26.3	58%	50%	25.8
South County East	DAVISVILLE 84	2A	115	34.5	45.1	51.8		1.7%		30.9	68%	60%	20.9	1.7%		31.4	70%	61%	20.4	1.7%		31.9	71%	62%	19.9
South County East	LAFAYETTE 30	1	34.5	12.47	7.6	8.6		1.7%		7.2	95%	84%	1.4	1.7%		7.3	96%	85%	1.3	1.7%		7.4	98%	86%	1.2
South County East	LAFAYETTE 30	2	34.5	12.47	12.3	13.2		1.7%		12.4	101%	94%	0.8	1.7%		12.6	102%	95%	0.6	1.7%		12.8	104%	97%	0.4
South County East	OLD BAPTIST ROAD 46	1	115	12.47	48.7	54.4		1.7%		25.9	53%	48%	28.5	1.7%		26.3	54%	48%	28.1	1.7%		26.8	55%	49%	27.6
South County East	OLD BAPTIST ROAD 46	2	115	12.47	48.9	51.9		1.7%		26.4	54%	51%	25.5	1.7%		26.9	55%	52%	25.0	1.7%		27.3	56%	53%	24.6
South County East	PEACEDALE 59	1	34.5	12.47	24.2	27.2		1.7%		17.5	72%	64%	9.7	1.7%		17.8	74%	65%	9.4	1.7%		18.1	75%	67%	9.1
South County East	PEACEDALE 59	2	34.5	12.47	24.2	27.2		1.7%		14.1	58%	52%	13.1	1.7%		14.3	59%	53%	12.9	1.7%		14.6	60%	54%	12.6
South County East	QUONSET 83	1	34.5	12.47	25.6	26.7		1.7%		21.6	85%	81%	5.1	1.7%		22.0	86%	82%	4.7	1.7%		22.4	87%	84%	4.3
South County East	TOWER HILL 88	1	115	12.47	50.0	60.0		1.7%		47.0	94%	78%	13.0	1.7%		47.8	96%	80%	12.2	1.7%		48.6	97%	81%	11.4
South County East	WAKEFIELD 17	4	34.5	12.47	12.9	13.5		1.7%		11.3	88%	84%	2.2	1.7%		11.5	89%	85%	2.0	1.7%		11.7	91%	87%	1.8
South County East	WAKEFIELD 17	3T	34.5	12.47	12.9	13.5		1.7%		14.6	113%	108%	-1.1	1.7%		14.9	115%	110%	-1.4	1.7%		15.1	117%	112%	-1.6
South County East	WAKEFIELD 17	5T	34.5	12.47	12.9	13.5		1.7%		13.5	105%	100%	0.0	1.7%		13.8	107%	102%	-0.3	1.7%		14.0	109%	104%	-0.5
South County East	WEST KINGSTON 62	1	115	34.5	43.9	55.7		1.7%		35.4	81%	64%	20.3	1.7%		35.9	82%	64%	19.8	1.7%		36.5	83%	66%	19.2
South County East	WEST KINGSTON 62	2	115	34.5	75.8	93.5		1.7%		53.3	70%	57%	40.2	1.7%		54.2	72%	58%	39.3	1.7%		55.2	73%	59%	38.3
South County West	ASHAWAY 43	1	34.5	12.47	8.4	9.1	Planned retire 2014 (Hopkinton related)																		
South County West	HOPE VALLEY 41	1	34.5	12.47	7.3	9.3	Planned retire 2014 (Hopkinton related)																		
South County West	HOPKINTON	1	115	12.47	50.0	55.0	Expected in-service 2014	1.7%		37.6	75%	68%	17.4	1.7%		38.2	76%	69%	16.8	1.7%		38.9	78%	71%	16.1
South County West	HOPKINTON	2	115	12.47	50.0	55.0	Expected in-service 2014	1.7%		32.6	65%	59%	22.4	1.7%		33.2	66%	60%	21.8	1.7%		33.7	67%	61%	21.3
South County West	KENYON 68	1	115	12.47	49.7	53.7		1.7%		28.6	58%	53%	25.1	1.7%		29.1	59%	54%	24.6	1.7%		29.6	60%	55%	24.1
South County West	KENYON 68	2	115	12.47	49.7	53.7		1.7%		22.6	45%	42%	31.1	1.7%		22.9	46%	43%	30.8	1.7%		23.3	47%	43%	30.4
South County West	LANGWORTHY 86	1	34.5	12.47	8.2	9.3	Planned retire 2014 (Hopkinton related)																		
South County West	LANGWORTHY 86	1	34.5	12.47	12.0	14.0	Expected in-service 2014	1.7%		12.6	105%	90%	1.4	1.7%		12.9	107%	92%	1.1	1.7%		13.1	109%	94%	0.9
South County West	WESTERLY 16	2	34.5	12.47	25.6	26.7	Planned retire 2014 (Hopkinton related)																		
South County West	WESTERLY 16	4	34.5	12.47	25.6	26.7	Planned retire 2014 (Hopkinton related)																		
South County West	WOOD RIVER 85	10	115	34.5	48.2	52.4		1.7%		4.5	9%	9%	47.9	1.7%		4.5	9%	9%	47.9	1.7%		4.6	10%	9%	47.8
South County West	WOOD RIVER 85	20	115	34.5	91.2	106.6		1.7%		19.6	22%	18%	87.0	1.7%		20.0	22%	19%	86.6	1.7%		20.3	22%	19%	86.3
Tiverton	TIVERTON 33	1	115	12.47	33.4	33.0				16.2	49%	49%	16.8			16.2	49%	49%	16.8			16.3	49%	49%	16.8
Tiverton	TIVERTON 33	2	115	12.47	49.4	53.7				17.9	36%	33%	35.8			17.9	36%	33%	35.8			17.9	36%	33%	35.8

Feeders - Normal Configuration Summary
2012 Annual Planning
Rhode Island Study Areas

							2011				2012				2013				2014				2015			
Study Area	Substation	Voltage (kV)	Feeder	SN Rating (Amps)	SE Rating (Amps)	Comments	Growth Rate	Spot Loads	Amps	%SN	Growth Rate	Spot Loads	Amps	%SN	Growth Rate	Spot Loads	Amps	%SN	Growth Rate	Spot Loads	Amps	%SN	Growth Rate	Spot Loads	Amps	%SN
Blackstone Valley North	FARNUM	23	105K1	515	515		Base Year		95	18%	3.7%		99	19%	0.9%		99	19%	0.9%		100	19%	0.6%		101	20%
Blackstone Valley North	HIGHLAND DRIVE	13.8	F1	585	585	Estimated in-service 2014	Base Year				3.7%								0.9%	308	308	53%	0.6%		310	53%
Blackstone Valley North	HIGHLAND DRIVE	13.8	F2	585	585	Estimated in-service 2014	Base Year				3.7%								0.9%	262	262	45%	0.6%		264	45%
Blackstone Valley North	HIGHLAND DRIVE	13.8	F3	585	585	Estimated in-service 2014	Base Year				3.7%								0.9%	289	289	49%	0.6%		291	50%
Blackstone Valley North	HIGHLAND DRIVE	13.8	F4	585	585	Estimated in-service 2014	Base Year				3.7%								0.9%	32	32	5%	0.6%		32	6%
Blackstone Valley North	HIGHLAND DRIVE	13.8	F5	515	515	Estimated in-service 2014	Base Year				3.7%								0.9%	394	394	77%	0.6%		396	77%
Blackstone Valley North	HIGHLAND DRIVE	13.8	F6	585	585	Estimated in-service 2014	Base Year				3.7%								0.9%	437	437	75%	0.6%		440	75%
Blackstone Valley North	NASONVILLE	13.8	127W43	585	585		Base Year		509	87%	3.7%		528	90%	0.9%		533	91%	0.9%		317	54%	0.6%		319	55%
Blackstone Valley North	NASONVILLE	13.8	127W40	461	515		Base Year		353	77%	3.7%		366	79%	0.9%		369	80%	0.9%		373	81%	0.6%		375	81%
Blackstone Valley North	NASONVILLE	13.8	127W41	432	515		Base Year		256	59%	3.7%		265	61%	0.9%		268	62%	0.9%		270	63%	0.6%		272	63%
Blackstone Valley North	NASONVILLE	13.8	127W42	458	515		Base Year		307	67%	3.7%	-191	127	28%	0.9%		129	28%	0.9%		317	69%	0.6%		319	70%
Blackstone Valley North	RIVERSIDE 8	13.8	108W51	499	631		Base Year		428	86%	3.7%		418	84%	0.9%		422	85%	0.9%		426	85%	0.6%		428	86%
Blackstone Valley North	RIVERSIDE 8	13.8	108W53	499	631		Base Year		365	73%	3.7%		379	76%	0.9%	47	429	86%	0.9%		433	87%	0.6%		435	87%
Blackstone Valley North	RIVERSIDE 8	13.8	108W55	474	474		Base Year		450	95%	3.7%		467	98%	0.9%		471	99%	0.9%	-441	34	7%	0.6%		34	7%
Blackstone Valley North	RIVERSIDE 8	13.8	108W60	515	515		Base Year		456	89%	3.7%		308	60%	0.9%		311	60%	0.9%		314	61%	0.6%		315	61%
Blackstone Valley North	RIVERSIDE 8	13.8	108W61	500	500		Base Year		338	68%	3.7%		122	24%	0.9%		123	25%	0.9%		124	25%	0.6%		125	25%
Blackstone Valley North	RIVERSIDE 8	13.8	108W62	515	515		Base Year		380	74%	3.7%		171	33%	0.9%	93	266	52%	0.9%		268	52%	0.6%		270	52%
Blackstone Valley North	RIVERSIDE 8	13.8	108W63	515	515		Base Year		460	89%	3.7%		485	94%	0.9%		489	95%	0.9%	-394	100	19%	0.6%		100	19%
Blackstone Valley North	RIVERSIDE 8	13.8	108W65	515	515		Base Year		352	68%	3.7%		334	65%	0.9%		337	65%	0.9%		340	66%	0.6%		342	66%
Blackstone Valley North	STAPLES 112	13.8	112W41	515	515		Base Year		430	84%	3.7%		439	85%	0.9%		443	86%	0.9%	-321	126	24%	0.6%		127	39%
Blackstone Valley North	STAPLES 112	13.8	112W42	500	599		Base Year		427	85%	3.7%		443	89%	0.9%		447	89%	0.9%		451	90%	0.6%		454	91%
Blackstone Valley North	STAPLES 112	13.8	112W43	515	515		Base Year		359	70%	3.7%		388	75%	0.9%		391	76%	0.9%	-229	166	32%	0.6%		167	45%
Blackstone Valley North	STAPLES 112	13.8	112W44	406	484		Base Year		407	100%	3.7%		391	96%	0.9%		395	97%	0.9%		398	98%	0.6%		400	99%
Blackstone Valley North	WOONSOCKET	13.8	26W41	515	515	In-Service 2012	Base Year				3.7%		181	35%	0.9%	127	310	60%	0.9%		312	61%	0.6%		314	61%
Blackstone Valley North	WOONSOCKET	13.8	26W42	515	515	In-Service 2012	Base Year				3.7%		286	56%	0.9%		289	56%	0.9%		291	57%	0.6%		293	57%
Blackstone Valley North	WOONSOCKET	13.8	26W43	515	515	In-Service 2012	Base Year				3.7%		461	90%	0.9%		465	90%	0.9%		469	91%	0.6%		472	92%
Blackstone Valley South	CENTRAL FALLS SUB	4.16	104J1	350	350		Base Year		75	21%	3.7%		78	22%	0.9%		78	22%	0.9%		79	23%	0.6%		80	23%
Blackstone Valley South	CENTRAL FALLS SUB	4.16	104J3	350	350		Base Year		116	33%	3.7%		120	34%	0.9%		121	35%	0.9%		122	35%	0.6%		123	35%
Blackstone Valley South	CENTRAL FALLS SUB	4.16	104J5	350	350		Base Year		160	46%	3.7%		166	47%	0.9%		167	48%	0.9%		169	48%	0.6%		170	49%
Blackstone Valley South	CENTRAL FALLS SUB	4.16	104J7	350	350		Base Year		155	44%	3.7%		161	46%	0.9%		163	46%	0.9%		164	47%	0.6%		165	47%
Blackstone Valley South	CENTRE ST	4.16	106J1	350	350		Base Year		108	31%	3.7%		112	32%	0.9%		113	32%	0.9%		114	33%	0.6%		115	33%
Blackstone Valley South	CENTRE ST	4.16	106J3	350	350		Base Year		151	43%	3.7%		157	45%	0.9%		158	45%	0.9%		159	46%	0.6%		160	46%
Blackstone Valley South	CENTRE ST	4.16	106J7	350	350		Base Year		60	17%	3.7%		62	18%	0.9%		63	18%	0.9%		63	18%	0.6%		64	18%
Blackstone Valley South	COTTAGE STREET SUB	4.16	109J1	408	408		Base Year		313	77%	3.7%		324	79%	0.9%		327	80%	0.9%		330	81%	0.6%		332	81%
Blackstone Valley South	COTTAGE STREET SUB	4.16	109J3	408	408		Base Year		237	58%	3.7%		246	60%	0.9%		248	61%	0.9%		251	61%	0.6%		252	62%
Blackstone Valley South	COTTAGE STREET SUB	4.16	109J5	408	408		Base Year		281	69%	3.7%		291	71%	0.9%		294	72%	0.9%		297	73%	0.6%		298	73%
Blackstone Valley South	CROSSMAN STREET SUB	4.16	111J1	350	350		Base Year		250	71%	3.7%		259	74%	0.9%		262	75%	0.9%		264	75%	0.6%		266	76%
Blackstone Valley South	CROSSMAN STREET SUB	4.16	111J3	350	350		Base Year		169	48%	3.7%		175	50%	0.9%		176	50%	0.9%		178	51%	0.6%		179	51%
Blackstone Valley South	DAGGETT SUB	4.16	113J1	390	390		Base Year		159	41%	3.7%		165	42%	0.9%		166	43%	0.9%		168	43%	0.6%		169	43%
Blackstone Valley South	DAGGETT SUB	4.16	113J2	390	390		Base Year		124	32%	3.7%		129	33%	0.9%		130	33%	0.9%		131	34%	0.6%		132	34%
Blackstone Valley South	FRONT ST. SUB	4.16	24J1	350	350		Base Year		150	43%	3.7%		156	44%	0.9%		157	45%	0.9%		158	45%	0.6%		159	46%
Blackstone Valley South	HYDE SUB	4.16	28J1	400	400		Base Year		110	28%	3.7%		114	29%	0.9%		115	29%	0.9%		116	29%	0.6%		117	29%
Blackstone Valley South	HYDE SUB	4.16	28J2	400	400		Base Year		154	39%	3.7%		160	40%	0.9%		161	40%	0.9%		163	41%	0.6%		164	41%
Blackstone Valley South	LEE STREET SUB	4.16	30J1	380	380		Base Year		200	53%	3.7%		207	55%	0.9%		209	55%	0.9%		211	56%	0.6%		212	56%
Blackstone Valley South	LEE STREET SUB	4.16	30J3	380	380		Base Year		320	84%	3.7%		332	87%	0.9%		335	88%	0.9%		338	89%	0.6%		340	89%
Blackstone Valley South	LEE STREET SUB	4.16	30J5	310	310		Base Year		125	40%	3.7%		130	42%	0.9%		131	42%	0.9%		132	43%	0.6%		133	43%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W1	350	350		Base Year		63	18%	3.7%		65	19%	0.9%		66	19%	0.9%		67	19%	0.6%		67	19%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W2	350	350		Base Year		42	12%	3.7%		44	12%	0.9%		44	13%	0.9%		44	13%	0.6%		45	13%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W3	350	350		Base Year		46	13%	3.7%		48	14%	0.9%		48	14%	0.9%		49	14%	0.6%		49	14%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W43	365	365		Base Year		230	63%	3.7%		239	65%	0.9%		241	66%	0.9%		243	67%	0.6%		244	67%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W49	202	250		Base Year		146	72%	3.7%		151	75%	0.9%		153	76%	0.9%		154	76%	0.6%		155	77%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W50	356	365		Base Year		237	67%	3.7%		246	69%	0.9%		248	70%	0.9%		250	70%	0.6%		252	71%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W51	365	365		Base Year		159	44%	3.7%		165	45%	0.9%		166	46%	0.9%		168	46%	0.6%		169	46%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W53	407	540		Base Year		211	52%	3.7%		219	54%	0.9%		221	54%	0.9%		223	55%	0.6%		224	55%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W60	334	449		Base Year		299	90%	3.7%		310	93%	0.9%		313	94%	0.9%		316	95%	0.6%		318	95%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W61	343	411		Base Year		308	90%	3.7%		319	93%	0.9%		322	94%	0.9%		325	95%	0.6%		327	95%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W62	480	480		Base Year		430	90%	3.7%		446	93%	0.9%		450	94%	0.9%		454	95%	0.6%		457	95%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W63	515	515		Base Year		389	76%	3.7%		403	78%	0.9%		407	79%	0.9%		411	80%	0.6%		413	80%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W65	345	360		Base Year		313	91%	3.7%		325	94%	0.9%		328	95%	0.9%		330	96%	0.6%		332	96%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W66	360	360		Base Year		146	41%	3.7%		151	42%	0.9%		153	42%	0.9%		154	43%	0.6%		155	43%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W80	285	365		Base Year		147	52%	3.7%		152	53%	0.9%		154	54%	0.9%		155	54%	0.6%		156	55%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W81	368	540		Base Year		348	95%	3.7%		361	98%	0.9%		364	99%	0.9%		367	100%	0.6%	-31	339	92%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W83	346	540		Base Year		277	80%	3.7%		287	83%	0.9%		290	84%	0.9%		292	85%	0.6%		294	85%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W84	332	365		Base Year		163	49%	3.7%		169	51%	0.9%		171	51%	0.9%		172	52%	0.6%	31	204	61%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W85	305	365		Base Year		242	79%	3.7%		251	82%	0.9%		253	83%	0.9%		255	84%	0.6%		257	84%
Blackstone Valley South	PAWTUCKET #2 STATION	4.16	148J1	370	370		Base Year		159	43%	3.7%		165	44%	0.9%		166	45%	0.9%		168	45%	0.6%		169	46%
Blackstone Valley South	PAWTUCKET #2 STATION	4.16	148J3	290	290		Base Year		109	38%	3.7%		113	39%	0.9%		114	39%	0.9%		115	40%	0.6%		116	40%
Blackstone Valley South	PAWTUCKET #2 STATION	4.16	148J5	370	370		Base Year		200	54%	3.7%		207	56%	0.9%		209	57%	0.9%		211	57%	0.6%		212	57%
Blackstone Valley South	PAWTUCKET #2 STATION	4.16	148J7	370	370		Base Year		211	57%	3.7%		219	59%	0.9%		221	60%	0.9%		223	60%	0.6%		224	61%
Blackstone Valley South	SOUTHEAST SUB	4.16	60J1	408	408		Base Year		85	21%	3.7%		88	22%	0.9%		89	22%	0.9%		90	22%	0.6%		91	22%
Blackstone Valley South	SOUTHEAST SUB	4.16	60J3	408	408		Base Year		115	28%	3.7%		119	29%	0.9%		120	29%	0.9%		121	30%	0.6%		122	30%
Blackstone Valley South	SOUTHEAST SUB	4.16	60J5	350	350		Base Year		109	31%	3.7%		113	32%	0.9%		114	33%	0.9%		115	33%	0.6%		116	33%
Blackstone Valley South	VALLEY SUB	13.8	102W41	493	515		Base Year		243	49%	3.7%		252	51%	0.9%		254	52%	0.9%		257	52%	0.6%		258	52%
Blackstone Valley South	VALLEY SUB	13.8	102W42	463	515		Base Year		396	86%	3.7%		411	89%	0.9%		414	89%	0.9%		418	90%	0.6%		421	91%
Blackstone Valley South	VALLEY SUB	13.8	102W44	328	460		Base Year		279	85%	3.7%		289	88%	0.9%		292	89%	0.9%		295	90%	0.6%		296	90%
Blackstone Valley South	VALLEY SUB	13.8	102W50	364	375		Base Year		141	39%	3.7%		146	40%	0.9%		148	41%	0.9%		149	41%	0.6%		150	41%
Blackstone Valley South	VALLEY SUB	13.8	102W51	341	497		Base Year		294	86%	3.7%		305	89%	0.9%		308	90%	0.9%		310	91%	0.6%		312	92%
Blackstone Valley South	VALLEY SUB	13.8	102W52	300	365		Base Year		101	34%	3.7%		105	35%	0.9%		106	35%	0.9%		107	36%	0.6%		107	36%
Blackstone Valley South	VALLEY SUB	13.8	102W54	292	413		Base Year		247	85%	3.7%		256	88%	0.9%		258	89%	0.9%		261	89%	0.6%		262	90%
Blackstone Valley South	WASHINGTON SUB	13.8	126W40	515	645		Base Year		248	48%	3.7%		257	50%	0.9%		259	50%	0.9%		262	51%	0.6%		263	51%
Blackstone Valley South	WASHINGTON SUB	13.8	126W41	520	535		Base Year		425	82%	3.7%		441	85%	0.9%		445	86%	0.9%		449	86%	0.6%		451	87%
Blackstone Valley South	WASHINGTON SUB	13.8	126W42	525	600		Base Year		346	66%	3.7%		359	68%	0.9%		362	69%	0.9%		365	70%	0.6%		367	70%
Blackstone Valley South	WASHINGTON SUB	13.8	126W50	528	645		Base Year		495	94%	3.7%		513	97%	0.9%		518	98%	0.9%		523	99%	0.6%		526	100%

Feeders - Normal Configuration Summary
2012 Annual Planning
Rhode Island Study Areas

Study Area	Substation	Voltage (kV)	Feeder	SN Rating (Amps)	SE Rating (Amps)	Comments	2011				2012				2013				2014				2015			
							Growth Rate	Spot Loads	Amps	%SN	Growth Rate	Spot Loads	Amps	%SN	Growth Rate	Spot Loads	Amps	%SN	Growth Rate	Spot Loads	Amps	%SN	Growth Rate	Spot Loads	Amps	%SN
Blackstone Valley South	WASHINGTON SUB	13.8	126W51	515	515		Base Year		455	88%	3.7%		472	92%	0.9%		476	92%	0.9%		480	93%	0.6%		483	94%
Blackstone Valley South	WASHINGTON SUB	13.8	126W53	583	750		Base Year		22	4%	3.7%		23	4%	0.9%		23	4%	0.9%		23	4%	0.6%		23	4%
Blackstone Valley South	WASHINGTON SUB	13.8	126W54	530	645		Base Year		400	75%	3.7%		415	78%	0.9%		419	79%	0.9%		422	80%	0.6%		425	80%
Central RI East	APPONAUG 3	12.47	3F1	510	510		Base Year		348	68%	6.7%		371	73%	4.1%		387	76%	4.0%		402	79%	3.1%	20	434	85%
Central RI East	APPONAUG 3	12.47	3F2	515	515		Base Year		363	70%	6.7%		387	75%	4.1%		403	78%	4.0%		419	81%	3.1%	-13	419	81%
Central RI East	DRUMROCK 14	12.47	14F1	530	612		Base Year		528	100%	6.7%	-110	453	86%	4.1%		472	89%	4.0%		491	93%	3.1%	-63	443	84%
Central RI East	DRUMROCK 14	12.47	14F2	530	595		Base Year		298	56%	6.7%	110	428	81%	4.1%		446	84%	4.0%		463	87%	3.1%	-80	398	75%
Central RI East	DRUMROCK 14	12.47	14F3	515	515		Base Year		363	70%	6.7%		387	75%	4.1%		403	78%	4.0%		419	81%	3.1%	-106	326	63%
Central RI East	DRUMROCK 14	12.47	14F4	515	515		Base Year		437	85%	6.7%		466	91%	4.1%		485	94%	4.0%		504	98%	3.1%	-153	367	71%
Central RI East	KILVERT STREET 87	12.47	87F1	530	645		Base Year		376	71%	6.7%		401	76%	4.1%		417	79%	4.0%		434	82%	3.1%		447	84%
Central RI East	KILVERT STREET 87	12.47	87F2	570	662		Base Year		285	50%	6.7%		304	53%	4.1%		317	56%	4.0%		330	58%	3.1%	-50	290	51%
Central RI East	KILVERT STREET 87	12.47	87F3	530	645		Base Year		297	56%	6.7%		317	60%	4.1%		330	62%	4.0%		343	65%	3.1%	-10	343	65%
Central RI East	KILVERT STREET 87	12.47	87F4	530	650		Base Year		299	56%	6.7%		319	60%	4.1%		332	63%	4.0%		345	65%	3.1%		356	67%
Central RI East	KILVERT STREET 87	12.47	87F5	530	650	Expected In-Service 2015	Base Year																3.1%	400	400	75%
Central RI East	KILVERT STREET 87	12.47	87F6	530	650	Expected In-Service 2015	Base Year																3.1%	250	250	47%
Central RI East	LINCOLN AVENUE 72	12.47	72F1	530	650		Base Year		347	65%	6.7%		370	70%	4.1%		385	73%	4.0%		400	75%	3.1%	-80	333	63%
Central RI East	LINCOLN AVENUE 72	12.47	72F2	530	650		Base Year		361	68%	6.7%		385	73%	4.1%		401	76%	4.0%		417	79%	3.1%		430	81%
Central RI East	LINCOLN AVENUE 72	12.47	72F3	530	650		Base Year		331	62%	6.7%		353	67%	4.1%		367	69%	4.0%		382	72%	3.1%		394	74%
Central RI East	LINCOLN AVENUE 72	12.47	72F4	530	650		Base Year		438	83%	6.7%		467	88%	4.1%		487	92%	4.0%		506	95%	3.1%	-60	462	87%
Central RI East	LINCOLN AVENUE 72	12.47	72F5	515	515		Base Year		424	82%	6.7%		452	88%	4.1%		471	91%	4.0%		490	95%	3.1%	-60	445	86%
Central RI East	LINCOLN AVENUE 72	12.47	72F6	645	645		Base Year		322	50%	6.7%		344	53%	4.1%		357	55%	4.0%		372	58%	3.1%	5	388	60%
Central RI East	PONTIAC 27	12.47	27F1	555	555	Limiting cable element upgraded 2016	Base Year		413	90%	6.7%		441	96%	4.1%		459	100%	4.0%		477	104%	3.1%		492	107%
Central RI East	PONTIAC 27	12.47	27F2	515	515	Limiting cable element upgraded 2016	Base Year		271	59%	6.7%		289	63%	4.1%		301	65%	4.0%		313	68%	3.1%		323	70%
Central RI East	PONTIAC 27	12.47	27F3	460	515		Base Year		179	39%	6.7%		191	42%	4.1%		199	43%	4.0%		207	45%	3.1%		213	46%
Central RI East	PONTIAC 27	12.47	27F4	460	515		Base Year		382	83%	6.7%		408	89%	4.1%		424	92%	4.0%		441	96%	3.1%		455	99%
Central RI East	PONTIAC 27	12.47	27F5	530	650	Limiting cable element upgraded 2016	Base Year		353	77%	6.7%		377	82%	4.1%		392	85%	4.0%		408	89%	3.1%		420	91%
Central RI East	PONTIAC 27	12.47	27F6	530	650	Limiting cable element upgraded 2016	Base Year		523	114%	6.7%		558	121%	4.1%		581	126%	4.0%		605	132%	3.1%		623	135%
Central RI East	WARWICK 52	12.47	52F1	409	476		Base Year		301	74%	6.7%		321	79%	4.1%		335	82%	4.0%		348	85%	3.1%	-120	239	58%
Central RI East	WARWICK 52	12.47	52F2	476	476		Base Year		216	45%	6.7%		230	48%	4.1%		240	50%	4.0%		250	53%	3.1%	-14	243	51%
Central RI East	WARWICK 52	12.47	52F3	526	560	Feeder Upgrade in 2014	Base Year		395	97%	6.7%		421	103%	4.1%		438	107%	4.0%		456	87%	3.1%		470	89%
Central RI West	ANTHONY	12.47	64F1	361	374		Base Year		392	109%	6.7%		418	116%	4.1%	-90	345	96%	4.0%		359	100%	3.1%	-115	255	71%
Central RI West	ANTHONY	12.47	64F2	361	374		Base Year		315	87%	6.7%		336	93%	4.1%		350	97%	4.0%		364	101%	3.1%	-140	235	65%
Central RI West	ARCTIC	4.16	49J1	295	352		Base Year		230	78%	6.7%		245	83%	4.1%		255	87%	4.0%		266	90%	3.1%	-25	249	84%
Central RI West	ARCTIC	4.16	49J2	295	352		Base Year		156	53%	6.7%		166	56%	4.1%		173	59%	4.0%		180	61%	3.1%	-125	61	21%
Central RI West	ARCTIC	4.16	49J3	295	315		Base Year		206	70%	6.7%		220	75%	4.1%		229	78%	4.0%		238	81%	3.1%		245	83%
Central RI West	ARCTIC	4.16	49J4	295	352	Planned retire 2015 - New London Ave Related	Base Year		275	93%	6.7%		293	99%	4.1%		305	104%	4.0%		318	108%	3.1%	-328	0	0%
Central RI West	COVENTRY	12.47	54F1	526	560		Base Year		367	70%	6.7%		392	74%	4.1%	-70	338	64%	4.0%		351	67%	3.1%		362	69%
Central RI West	DIVISION ST	12.47	61F1	450	476		Base Year		345	77%	6.7%		368	82%	4.1%		383	85%	4.0%		399	89%	3.1%		411	91%
Central RI West	DIVISION ST	12.47	61F2	450	476		Base Year		357	79%	6.7%		381	85%	4.1%		397	88%	4.0%		412	92%	3.1%		425	94%
Central RI West	DIVISION ST	12.47	61F3	450	476		Base Year		272	60%	6.7%		290	64%	4.1%		302	67%	4.0%		314	70%	3.1%	50	374	83%
Central RI West	DIVISION ST	12.47	61F4	450	645		Base Year		348	77%	6.7%		371	83%	4.1%		387	86%	4.0%		402	89%	3.1%		414	92%
Central RI West	HOPE	12.47	15F1	348	394		Base Year		335	96%	6.7%		357	103%	4.1%	-45	327	94%	4.0%		340	98%	3.1%	-80	271	78%
Central RI West	HOPE	12.47	15F2	476	476		Base Year		458	96%	6.7%		489	103%	4.1%		509	107%	4.0%		529	111%	3.1%	-95	450	95%
Central RI West	HOPKINS HILL	12.47	63F1	538	650		Base Year		236	44%	6.7%		252	47%	4.1%		262	49%	4.0%		273	51%	3.1%		281	52%
Central RI West	HOPKINS HILL	12.47	63F2	530	650		Base Year		464	88%	6.7%		495	93%	4.1%		515	97%	4.0%		536	101%	3.1%	-60	493	93%
Central RI West	HOPKINS HILL	12.47	63F3	530	650		Base Year		515	97%	6.7%		550	104%	4.1%	-220	352	66%	4.0%		366	69%	3.1%		377	71%
Central RI West	HOPKINS HILL	12.47	63F4	530	650		Base Year		325	61%	6.7%		347	65%	4.1%	50	411	78%	4.0%		427	81%	3.1%		441	83%
Central RI West	HOPKINS HILL	12.47	63F5	530	650		Base Year		430	81%	6.7%		459	87%	4.1%		478	90%	4.0%		497	94%	3.1%	-130	382	72%
Central RI West	HOPKINS HILL	12.47	63F6	530	650		Base Year		436	82%	6.7%		465	88%	4.1%		484	91%	4.0%		504	95%	3.1%		519	98%
Central RI West	HUNT RIVER	12.47	40F1	274	327	Planned retire 2017 - Flood Mitigation	Base Year		204	74%	6.7%		218	79%	4.1%		227	83%	4.0%		236	86%	3.1%		243	89%
Central RI West	KENT COUNTY	12.47	22F1	530	650		Base Year		412	78%	6.7%		440	83%	4.1%		458	86%	4.0%		476	90%	3.1%		491	93%
Central RI West	KENT COUNTY	12.47	22F2	530	650		Base Year		415	78%	6.7%		443	84%	4.1%		461	87%	4.0%		479	90%	3.1%		494	93%
Central RI West	KENT COUNTY	12.47	22F3	530	650		Base Year		473	89%	6.7%		505	95%	4.1%		525	99%	4.0%		546	103%	3.1%	-220	343	65%
Central RI West	KENT COUNTY	12.47	22F4	586	662		Base Year		502	86%	6.7%		536	91%	4.1%		558	95%	4.0%		580	99%	3.1%	-60	538	92%
Central RI West	KENT COUNTY	12.47	22F6	530	650	Expected In-Service 2017	Base Year			0%				0%				0%				0%				0%
Central RI West	NATICK	12.47	29F1	526	560		Base Year		389	74%	6.7%		415	79%	4.1%		432	82%	4.0%		449	85%	3.1%	-70	393	75%
Central RI West	NATICK	12.47	29F2	408	408		Base Year		324	79%	6.7%		346	85%	4.1%		360	88%	4.0%		374	92%	3.1%		386	95%
Central RI West	TIOGUE AVE	12.47	100F1	570	612	In-Service 2013	Base Year			0%				0%	4.1%	425	425	75%	4.0%		442	78%	3.1%		456	80%
Central RI West	WARWICK MALL	12.47	28F1	390	412		Base Year		160	41%	6.7%		171	44%	4.1%		178	46%	4.0%		185	47%	3.1%		191	49%
Central RI West	WARWICK MALL	12.47	28F2	390	422		Base Year		120	31%	6.7%		128	33%	4.1%		133	34%	4.0%		139	36%	3.1%		143	37%
Central RI West	NEW LONDON AVE	12.47	150F1	645	645	Expected In-Service 2015	Base Year																3.1%	350	350	54%
Central RI West	NEW LONDON AVE	12.47	150F3	530	650	Expected In-Service 2015	Base Year																3.1%	290	290	55%
Central RI West	NEW LONDON AVE	12.47	150F5	530	650	Expected In-Service 2015	Base Year																3.1%	325	325	61%
Central RI West	NEW LONDON AVE	12.47	150F7	645	645	Expected In-Service 2015	Base Year																3.1%	250	250	39%
East Bay	BARRINGTON 4	12.47	4F1	515	515		Base Year		498	97%	3.8%	-10.5	506	98%	1.0%		511	99%	1.0%	-36	481	93%	0.7%		484	94%
East Bay	BARRINGTON 4	12.47	4F2	510	510		Base Year		356	70%	3.8%	48.5	418	82%	1.0%		422	83%	1.0%	36	462	91%	0.7%		466	91%
East Bay	BRISTOL 51A	12.47	51F1	502	612		Base Year		478	95%	3.8%		496	99%	1.0%		501	100%	1.0%	-44	462	92%	0.7%		465	93%
East Bay	BRISTOL 51A	12.47	51F2	530	612		Base Year		429	81%	3.8%		445	84%	1.0%		450	85%	1.0%		454	86%	0.7%		457	86%
East Bay	BRISTOL 51A	12.47	51F3	502	612		Base Year		368	73%	3.8%		382	76%	1.0%		386	77%	1.0%	44	434	86%	0.7%		437	87%
East Bay	KENT CORNERS 47	4.16	47J1	285	313		Base Year		35	12%	3.8%		36	13%	1.0%		37	13%	1.0%		37	13%	0.7%		37	13%
East Bay	KENT CORNERS 47	4.16	47J2	379	408		Base Year		300	79%	3.8%		311	82%	1.0%		315	83%	1.0%		318	84%	0.7%		320	84%
East Bay	KENT CORNERS 47	4.16	47J3	379	408	Upgrade limiting element (regualtors) 2013	Base Year		332	116%	3.8%		345	121%	1.0%		348	92%	1.0%		352	93%	0.7%		354	93%
East Bay	KENT CORNERS 47	4.16	47J4	379	408		Base Year		296	78%	3.8%		307	81%	1.0%		310	82%	1.0%		313	83%	0.7%		316	83%
East Bay	PHILLIPSDALE 20	12.47	20F1	425	450		Base Year		259	61%	3.8%		269	63%	1.0%		272	64%	1.0%		274	65%	0.7%		276	65%
East Bay	PHILLIPSDALE 20	12.47	20F2	425	450		Base Year		309	73%	3.8%		321	76%	1.0%		324	76%	1.0%		328	77%	0.7%		330	78%
East Bay	WAMPANOAG 48	12.47	48F1	502	507		Base Year		450	90%	3.8%		467	93%	1.0%		472	94%	1.0%		476	95%	0.7%		480	96%
East Bay	WAMPANOAG 48	12.47	48F2	515	515		Base Year		372	72%	3.8%		386	75%	1.0%		390	76%	1.0%		394	76%	0.7%		397	77%
East Bay	WAMPANOAG 48	12.47	48F3	510	515		Base Year		496	97%	3.8%	-38	477	93%	1.0%		482	94%	1.0%		486	95%	0.7%		490	96%
East Bay	WAMPANOAG 48	12.47	48F4	530	612		Base Year		501	95%	3.8%		520	98%	1.0%		525	99%	1.0%	-42	488	92%	0.7%		492	93%
East Bay	WAMPANOAG 48	12.47	48F5	485	490		Base Year		373	77%	3.8%		387	80%	1.0%		391	81%	1.0%	42	437	90%	0.7%		440	91%
East Bay	WAMPANOAG 48	12.47	48F6	530	612		Base Year		569	107%	3.8%	-154	437	82%	1.0%		441	83%	1.0%		446	84%	0.7%		449	85%
East Bay	WARREN 5	12.47	5F1	425	520		Base Year		409	96%	3.8%		425	100%	1.0%	-105	324	76%	1.0%		327	77%	0.7%		329	77%
East Bay	WARREN 5	12.47	5F2	434	434		Base Year		403	93%	3.8%		418	96%	1.0%		422	97%	1.0%		426	98%	0.7%		429	99%

Feeders - Normal Configuration Summary
2012 Annual Planning
Rhode Island Study Areas

							2011				2012				2013				2014				2015			
Study Area	Substation	Voltage (kV)	Feeder	SN Rating (Amps)	SE Rating (Amps)	Comments	Growth Rate	Spot Loads	Amps	%SN	Growth Rate	Spot Loads	Amps	%SN	Growth Rate	Spot Loads	Amps	%SN	Growth Rate	Spot Loads	Amps	%SN	Growth Rate	Spot Loads	Amps	%SN
East Bay	WARREN 5	12.47	5F3	515	515		Base Year		354	69%	3.8%		368	71%	1.0%		371	72%	1.0%		375	73%	0.7%		378	73%
East Bay	WARREN 5	12.47	5F4	510	510		Base Year		430	84%	3.8%		446	87%	1.0%		450	88%	1.0%		455	89%	0.7%		458	90%
East Bay	WATERMAN AVENUE 78	12.47	78F3	409	489		Base Year		220	54%	3.8%	110	338	83%	1.0%		342	84%	1.0%		345	84%	0.7%		348	85%
East Bay	WATERMAN AVENUE 78	12.47	78F4	409	489		Base Year		230	56%	3.8%	44	282	69%	1.0%		285	70%	1.0%		288	70%	0.7%		290	71%
Newport	BAILEY BROOK	4.16	19J14	476	476	Planned retire 2015 (Newport related)	Base Year		272	57%	6.2%	-125	164	34%	3.6%		170	36%	3.5%		176	37%	2.7%	-181	-1	0%
Newport	BAILEY BROOK	4.16	19J16	476	476	Planned retire 2015 (Newport related)	Base Year		23	5%	6.2%		24	5%	3.6%		25	5%	3.5%		26	6%	2.7%	-27	0	0%
Newport	BAILEY BROOK	4.16	19J2	447	476	Planned retire 2015 (Newport related)	Base Year		220	49%	6.2%		234	52%	3.6%		242	54%	3.5%		251	56%	2.7%	-257	0	0%
Newport	CLARKE STREET	4.16	65J12	575	575	Planned Upgrade 2015	Base Year		268	97%	6.2%		285	103%	3.6%		295	106%	3.5%		305	110%	2.7%	90	403	70%
Newport	CLARKE STREET	4.16	65J2	570	595		Base Year		474	93%	6.2%		503	99%	3.6%		522	102%	3.5%		540	108%	2.7%	-90	464	81%
Newport	DEXTER	13.8	36W41	464	566		Base Year		321	69%	6.2%		341	73%	3.6%		353	76%	3.5%		366	79%	2.90%		376	81%
Newport	DEXTER	13.8	36W42	464	515		Base Year		206	44%	6.2%		219	47%	3.6%		227	49%	3.5%		235	51%	2.7%		241	52%
Newport	DEXTER	13.8	36W43	464	566		Base Year		148	32%	6.2%		157	34%	3.6%		163	35%	3.5%		169	36%	2.7%		173	37%
Newport	DEXTER	13.8	36W44	464	566		Base Year		276	59%	6.2%		293	63%	3.6%		304	65%	3.5%		314	68%	2.7%		323	70%
Newport	ELDRED	4.16	45J2	448	476	Planned retire 2015	Base Year		195	44%	6.2%		207	46%	3.6%		215	48%	3.5%		222	50%	2.7%	-228	0	0%
Newport	ELDRED	4.16	45J4	340	340	Planned retire 2015	Base Year		255	75%	6.2%		271	80%	3.6%		281	83%	3.5%		290	85%	2.7%	-298	0	0%
Newport	ELDRED	4.16	45J6	448	476	Planned retire 2015	Base Year		156	35%	6.2%		166	37%	3.6%		172	38%	3.5%		178	40%	2.7%	-182	0	0%
Newport	ELDRED NEW	4.16	45J1	530	600	Expected in-service 2015	Base Year																2.7%	400	400	75%
Newport	ELDRED NEW	4.16	45J2	530	600	Expected in-service 2015	Base Year																2.7%	308	308	58%
Newport	GATE II	4.16	38J2	440	476	Planned retire 2015 (Newport related)	Base Year		258	59%	6.2%		274	62%	3.6%		284	65%	3.5%		294	67%	2.7%	-302	0	0%
Newport	GATE II	4.16	38J4	440	476	Planned retire 2015 (Newport related)	Base Year		368	84%	6.2%		391	89%	3.6%		405	92%	3.5%		419	95%	2.7%	-430	0	0%
Newport	HARRISON	4.16	32J12	530	540		Base Year		320	60%	6.2%		340	64%	3.6%		352	66%	3.5%		364	69%	2.7%		374	71%
Newport	HARRISON	4.16	32J14	366	500		Base Year		287	78%	6.2%		305	83%	3.6%		316	86%	3.5%		327	89%	2.7%		336	92%
Newport	HARRISON	4.16	32J2	350	420		Base Year		221	63%	6.2%		235	67%	3.6%		243	69%	3.5%		252	72%	2.7%		258	74%
Newport	HARRISON	4.16	32J4	300	380		Base Year		120	40%	6.2%		127	42%	3.6%		132	44%	3.5%		137	46%	2.7%		140	47%
Newport	HOSPITAL	4.16	146J12	434	434		Base Year		137	32%	6.2%		145	34%	3.6%		151	35%	3.5%		156	36%	2.7%		160	37%
Newport	HOSPITAL	4.16	146J14	307	365		Base Year		120	39%	6.2%		127	42%	3.6%		132	43%	3.5%		137	45%	2.7%		140	46%
Newport	HOSPITAL	4.16	146J2	300	357		Base Year		124	41%	6.2%		132	44%	3.6%		136	45%	3.5%		141	47%	2.7%	-1	144	48%
Newport	HOSPITAL	4.16	146J4	434	434		Base Year		195	45%	6.2%		207	48%	3.6%		215	49%	3.5%		222	51%	2.7%		228	53%
Newport	JEPSON	4.16	37J2	380	380	Planned retire 2015 (Newport related)	Base Year		82	22%	6.2%		87	23%	3.6%		90	24%	3.5%		93	25%	2.7%	-96	0	0%
Newport	JEPSON	4.16	37J4	380	380	Planned retire 2015 (Newport related)	Base Year		244	64%	6.2%		259	68%	3.6%		268	71%	3.5%		278	73%	2.7%	-286	-1	0%
Newport	JEPSON	13.8	37W41	560	560		Base Year		319	57%	6.2%		339	60%	3.6%		351	63%	3.5%		363	65%	2.7%	-162	211	38%
Newport	JEPSON	13.8	37W42	560	560		Base Year		438	78%	6.2%		465	83%	3.6%		482	86%	3.5%		499	89%	2.7%	-132	380	68%
Newport	JEPSON	13.8	37W43	560	560		Base Year		422	75%	6.2%		448	80%	3.6%		464	83%	3.5%		481	86%	2.7%	-144	350	62%
Newport	KINGSTON	4.16	131J12	380	380		Base Year		288	76%	6.2%		306	80%	3.6%		317	83%	3.5%		328	86%	2.7%	-35	302	79%
Newport	KINGSTON	4.16	131J14	307	365		Base Year		222	72%	6.2%		236	77%	3.6%		244	80%	3.5%		253	82%	2.7%		260	85%
Newport	KINGSTON	4.16	131J2	397	510		Base Year		325	82%	6.2%		345	87%	3.6%		358	90%	3.5%		370	93%	2.7%	-40	340	86%
Newport	KINGSTON	4.16	131J4	510	510		Base Year		316	62%	6.2%		336	66%	3.6%		348	68%	3.5%		360	71%	2.7%	-64	306	60%
Newport	KINGSTON	4.16	131J6	380	380		Base Year		131	34%	6.2%		139	37%	3.6%		144	38%	3.5%		149	39%	2.7%	-100	53	14%
Newport	MERTON	4.16	51J12	356	408		Base Year		120	34%	6.2%		127	36%	3.6%		132	37%	3.5%		137	38%	2.7%		140	39%
Newport	MERTON	4.16	51J14	310	368		Base Year		128	41%	6.2%		136	44%	3.6%		141	45%	3.5%		146	47%	2.7%		150	48%
Newport	MERTON	4.16	51J16	380	380		Base Year		240	63%	6.2%		255	67%	3.6%		264	69%	3.5%		273	72%	2.7%		281	74%
Newport	MERTON	4.16	51J2	310	333		Base Year		187	60%	6.2%	50	249	80%	3.6%		258	83%	3.5%		267	86%	2.7%		274	88%
Newport	NEWPORT SUB	13.8	W1	530	600	Expected in-service 2015	Base Year																2.7%	264	264	50%
Newport	NEWPORT SUB	13.8	W2	530	600	Expected in-service 2015	Base Year																2.7%	302	302	57%
Newport	NEWPORT SUB	13.8	W3	530	600	Expected in-service 2015	Base Year																2.7%	286	286	54%
Newport	NEWPORT SUB	13.8	W4	530	600	Expected in-service 2015	Base Year																2.7%	407	407	77%
Newport	NEWPORT SUB	13.8	W5	530	600	Expected in-service 2015	Base Year																2.7%	208	208	39%
Newport	NO. AQUIDNECK	4.16	21J2	480	480		Base Year		187	39%	6.2%		199	41%	3.6%		206	43%	3.5%		213	44%	2.7%	-42	177	37%
Newport	NO. AQUIDNECK	4.16	21J4	480	480		Base Year		200	42%	6.2%	90	302	63%	3.6%		313	65%	3.5%		324	68%	2.7%		333	69%
Newport	NO. AQUIDNECK	4.16	21J6	480	480	Planned retire 2015 (Newport related)	Base Year		233	49%	6.2%		247	52%	3.6%		256	53%	3.5%		265	55%	2.7%	-273	-1	0%
Newport	SO. AQUIDNECK	4.16	122J2	481	510		Base Year		360	75%	6.2%		382	79%	3.6%		396	82%	3.5%		410	85%	2.7%		421	88%
Newport	SO. AQUIDNECK	4.16	122J4	480	510		Base Year		445	93%	6.2%	-90	383	80%	3.6%		396	83%	3.5%		410	85%	2.7%	-194	227	47%
Newport	SO. AQUIDNECK	4.16	122J6	480	480	Planned retire 2015 (Newport related)	Base Year		207	43%	6.2%		220	46%	3.6%		228	47%	3.5%		236	49%	2.7%	-242	0	0%
Newport	VERNON	4.16	23J12	384	408	Planned retire 2015 (Newport related)	Base Year		122	32%	6.2%	100	230	60%	3.6%		238	62%	3.5%		246	64%	2.7%	-253	0	0%
Newport	VERNON	4.16	23J14	384	408	Planned retire 2015 (Newport related)	Base Year		42	11%	6.2%	-45	0	0%	3.6%		0	0%	3.5%		0	0%	2.7%		0	0%
Newport	VERNON	4.16	23J2	384	408	Planned retire 2015 (Newport related)	Base Year		125	33%	6.2%	25	158	41%	3.6%		163	43%	3.5%		169	44%	2.7%	-174	0	0%
Newport	VERNON	4.16	23J4	384	408	Planned retire 2015 (Newport related)	Base Year		205	53%	6.2%		218	57%	3.6%		226	59%	3.5%		233	61%	2.7%	-240	0	0%
Newport	VERNON	4.16	23J6	384	408	Planned retire 2015 (Newport related)	Base Year		122	32%	6.2%		130	34%	3.6%		134	35%	3.5%		139	36%	2.7%	-143	0	0%
Newport	WEST HOWARD	4.16	154J14	290	350		Base Year		98	34%	6.2%	115	219	76%	3.6%		227	78%	3.5%		235	81%	2.7%		241	83%
Newport	WEST HOWARD	4.16	154J16	270	340		Base Year		261	97%	6.2%	-60	217	80%	3.6%		225	83%	3.5%		233	86%	2.7%		239	89%
Newport	WEST HOWARD	4.16	154J18	380	380		Base Year		305	80%	6.2%	-50	274	72%	3.6%		284	75%	3.5%		294	77%	2.7%	35	337	89%
Newport	WEST HOWARD	4.16	154J2	480	688		Base Year		434	90%	6.2%	-150	311	65%	3.6%		322	67%	3.5%		333	69%	2.7%		342	71%
Newport	WEST HOWARD	4.16	154J4	290	350		Base Year		319	110%	6.2%	-115	224	77%	3.6%		232	80%	3.5%		240	83%	2.7%		246	85%
Newport	WEST HOWARD	4.16	154J6	268	346		Base Year		0	0%	6.2%	210	210	78%	3.6%		218	81%	3.5%		225	84%	2.7%		231	86%
Newport	WEST HOWARD	4.16	154J8	380	380		Base Year		306	81%	6.2%		325	86%	3.6%		337	89%	3.5%		348	92%	2.7%	-35	323	85%
North Central RI	CENTREDALE 50	12.47	50F2	367	386		Base Year		220	60%	3.7%		228	62%	3.9%		237	64%	2.9%		244	66%	2.5%		250	68%
North Central RI	CENTREDALE 50	4.16	50J1	285	313		Base Year		160	56%	3.7%		166	58%	3.9%		172	60%	2.9%		177	62%	2.5%		182	64%
North Central RI	CENTREDALE 50	4.16	50J2	295	352		Base Year		0	0%	3.7%		0	0%	3.9%		0	0%	2.9%		0	0%	2.5%		0	0%
North Central RI	CENTREDALE 50	4.16	50J3	408	408		Base Year		240	59%	3.7%		248	61%	3.9%		258	63%	2.9%		266	65%	2.5%		272	67%
North Central RI	CHOPMIST 34	12.47	34F1	530	544		Base Year		440	83%	3.7%		457	86%	3.9%		474	90%	2.9%		488	92%	2.5%		500	94%
North Central RI	CHOPMIST 34	12.47	34F2	415	415		Base Year		306	74%	3.7%		317	76%	3.9%		330	79%	2.9%		339	82%	2.5%		348	84%
North Central RI	CHOPMIST 34	12.47	34F3	385	385		Base Year		271	70%	3.7%		281	73%	3.9%		292	76%	2.9%		301	78%	2.5%		308	80%
North Central RI	FARNUM PIKE 23	12.47	23F1	530	650		Base Year		347	65%	3.7%		360	68%	3.9%		374	71%	2.9%		385	73%	2.5%		394	74%
North Central RI	FARNUM PIKE 23	12.47	23F2	515	515		Base Year		391	76%	3.7%		405	79%	3.9%		421	82%	2.9%		433	84%	2.5%		444	86%
North Central RI	FARNUM PIKE 23	12.47	23F3	530	640		Base Year		452	85%	3.7%		469	88%	3.9%		487	92%	2.9%		501	95%	2.5%		514	97%
North Central RI	FARNUM PIKE 23	12.47	23F4	530	612		Base Year		282	53%	3.7%		292	55%	3.9%		303	57%	2.9%		312	59%	2.5%		320	60%
North Central RI	FARNUM PIKE 23	12.47	23F5	515	515		Base Year		120	23%	3.7%		124	24%	3.9%		129	25%	2.9%		133	26%	2.5%		136	26%
North Central RI	FARNUM PIKE 23	12.47	23F6	515	515		Base Year		467	91%	3.7%		484	94%	3.9%		503	98%	2.9%	-92	425	83%	2.5%		436	85%
North Central RI	JOHNSTON 18	12.47	18F1	526	626		Base Year		391	74%	3.7%		405	77%	3.9%	-99	322	61%	2.9%		332	63%	2.5%		340	65%
North Central RI	JOHNSTON 18	12.47	18F10	530	612	Expected in-service 2013	Base Year								3.9%	453	453	85%	2.9%		466	88%	2.5%		478	90%
North Central RI	JOHNSTON 18	12.47	18F2	452	515		Base Year		328	73%	3.7%		340	75%	3.9%		353	78%	2.9%		364	80%	2.5%		373	82%
North Central RI	JOHNSTON 18	12.47	18F3	515	515		Base Year		500	97%	3.7%	-12	507	98%	3.9%	-183	344	67%	2.9%		354	69%	2.5%		362	70%
North Central RI	JOHNSTON 18	12.47	18F4	530	560		Base Year		261	49%	3.7%		270	51%	3.9%		281	53%	2.9%		289	55%	2.5%		296	56%

Feeders - Normal Configuration Summary
2012 Annual Planning
Rhode Island Study Areas

							2011				2012				2013				2014				2015			
Study Area	Substation	Voltage (kV)	Feeder	SN Rating (Amps)	SE Rating (Amps)	Comments	Growth Rate	Spot Loads	Amps	%SN	Growth Rate	Spot Loads	Amps	%SN	Growth Rate	Spot Loads	Amps	%SN	Growth Rate	Spot Loads	Amps	%SN	Growth Rate	Spot Loads	Amps	%SN
North Central RI	JOHNSTON 18	12.47	18F5	530	612		Base Year		437	82%	3.7%		453	85%	3.9%	-87	383	72%	2.9%		395	74%	2.5%		404	76%
North Central RI	JOHNSTON 18	12.47	18F6	515	515		Base Year		439	85%	3.7%		456	88%	3.9%		473	92%	2.9%		487	95%	2.5%		499	97%
North Central RI	JOHNSTON 18	12.47	18F7	530	612		Base Year		460	87%	3.7%		477	90%	3.9%	-200	295	56%	2.9%		304	57%	2.5%		311	59%
North Central RI	JOHNSTON 18	12.47	18F8	530	612		Base Year		261	49%	3.7%		270	51%	3.9%		281	53%	2.9%	111	400	75%	2.5%		410	77%
North Central RI	JOHNSTON 18	12.47	18F9	530	612		Base Year		413	78%	3.7%		428	81%	3.9%		445	84%	2.9%		458	86%	2.5%		469	89%
North Central RI	MANTON 69	12.47	69F1	515	515		Base Year		462	90%	3.7%		480	93%	3.9%		498	97%	2.9%	-111	402	78%	2.5%		412	80%
North Central RI	MANTON 69	12.47	69F3	502	515		Base Year		432	86%	3.7%		448	89%	3.9%		466	93%	2.9%		479	96%	2.5%		491	98%
North Central RI	PUTNAM PIKE 38	12.47	38F1	530	650		Base Year		491	93%	3.7%		509	96%	3.9%	-115	414	78%	2.9%		426	80%	2.5%		436	82%
North Central RI	PUTNAM PIKE 38	12.47	38F2	530	650		Base Year		201	38%	3.7%		208	39%	3.9%	115	331	63%	2.9%		341	64%	2.5%		349	66%
North Central RI	PUTNAM PIKE 38	12.47	38F3	530	650		Base Year		419	79%	3.7%		435	82%	3.9%		452	85%	2.9%		465	88%	2.5%		477	90%
North Central RI	PUTNAM PIKE 38	12.47	38F4	515	515		Base Year		195	38%	3.7%		203	39%	3.9%		211	41%	2.9%		217	42%	2.5%		222	43%
North Central RI	PUTNAM PIKE 38	12.47	38F5	530	612		Base Year		404	76%	3.7%		419	79%	3.9%		435	82%	2.9%		447	84%	2.5%		459	87%
North Central RI	PUTNAM PIKE 38	12.47	38F6	530	612		Base Year		370	70%	3.7%		384	72%	3.9%		399	75%	2.9%		410	77%	2.5%		420	79%
North Central RI	SHUNPIKE SIMS	13.2	35F8	700	765	Expected in-service 2014	Base Year												2.9%	481	481	69%	2.5%		493	70%
North Central RI	SHUNPIKE 35	12.47	35F1	543	727	Expected in-service 2018	Base Year																			
North Central RI	SHUNPIKE 35	12.47	35F2	538	698	Expected in-service 2018	Base Year																			
North Central RI	SHUNPIKE 35	12.47	35F3	510	694	Expected in-service 2018	Base Year																			
North Central RI	WEST CRANSTON 21	12.47	21F1	515	515		Base Year		488	95%	3.7%		506	98%	3.9%	-40	485	94%	2.9%		500	97%	2.5%		512	99%
North Central RI	WEST CRANSTON 21	12.47	21F2	515	515		Base Year		412	80%	3.7%		427	83%	3.9%		444	86%	2.9%		457	89%	2.5%		468	91%
North Central RI	WEST CRANSTON 21	12.47	21F4	515	515		Base Year		420	82%	3.7%		436	85%	3.9%	32	485	94%	2.9%		499	97%	2.5%		511	99%
North Central RI	WEST GREENVILLE 45	12.47	45F2	425	520		Base Year		118	28%	3.7%		122	29%	3.9%		127	30%	2.9%		131	31%	2.5%		134	31%
Providence	ADMIRAL STREET 9	11.5	1115	250	250		Base Year		50	20%	3.8%		52	21%	1.0%		52	21%	1.0%		53	21%	0.7%		53	
Providence	ADMIRAL STREET 9	11.5	1117	250	250		Base Year		160	64%	3.8%		166	66%	1.0%		168	67%	1.0%		169	68%	0.7%		171	
Providence	ADMIRAL STREET 9	11.5	1119	250	250		Base Year		77	31%	3.8%		80	32%	1.0%		80	32%	1.0%		81	32%	0.7%		82	
Providence	ADMIRAL STREET 9	4.16	9J1	297	326		Base Year		270	91%	3.8%		280	94%	1.0%		283	95%	1.0%		286	96%	0.7%		288	97%
Providence	ADMIRAL STREET 9	4.16	9J2	369	441		Base Year		160	43%	3.8%		166	45%	1.0%		168	45%	1.0%		169	46%	0.7%		171	46%
Providence	ADMIRAL STREET 9	4.16	9J3	255	255		Base Year		260	102%	3.8%	-68	202	79%	1.0%		204	80%	1.0%		206	81%	0.7%		207	81%
Providence	ADMIRAL STREET 9	4.16	9J5	297	326		Base Year		153	52%	3.8%		159	53%	1.0%		160	54%	1.0%		162	55%	0.7%		163	55%
Providence	CLARKSON STREET 13	12.47	13F1	400	533		Base Year		294	74%	3.8%		305	76%	1.0%		309	77%	1.0%		312	78%	0.7%		314	78%
Providence	CLARKSON STREET 13	12.47	13F10	400	533	Expeted in-service 2013	Base Year								1.0%	246	246	62%	1.0%		248	62%	0.7%		250	63%
Providence	CLARKSON STREET 13	12.47	13F2	540	612		Base Year		497	92%	3.8%		516	96%	1.0%	-147	374	69%	1.0%		378	70%	0.7%		380	70%
Providence	CLARKSON STREET 13	12.47	13F3	425	612		Base Year		391	92%	3.8%		406	95%	1.0%	-12	398	94%	1.0%		402	95%	0.7%		405	95%
Providence	CLARKSON STREET 13	12.47	13F4	520	612		Base Year		440	85%	3.8%		457	88%	1.0%		461	89%	1.0%	36	502	97%	0.7%		505	97%
Providence	CLARKSON STREET 13	12.47	13F5	455	612		Base Year		335	74%	3.8%		348	76%	1.0%		351	77%	1.0%		355	78%	0.7%		357	79%
Providence	CLARKSON STREET 13	12.47	13F6	415	542		Base Year		212	51%	3.8%		220	53%	1.0%		222	54%	1.0%		224	54%	0.7%		226	54%
Providence	CLARKSON STREET 13	12.47	13F7	436	571		Base Year		251	58%	3.8%		261	60%	1.0%		263	60%	1.0%		266	61%	0.7%		268	61%
Providence	CLARKSON STREET 13	12.47	13F8	437	563		Base Year		278	64%	3.8%		289	66%	1.0%		292	67%	1.0%		295	67%	0.7%		297	68%
Providence	CLARKSON STREET 13	12.47	13F9	530	612		Base Year		411	77%	3.8%		426	80%	1.0%		431	81%	1.0%	56	491	93%	0.7%		494	93%
Providence	DYER STREET 2	11.5	1103	250	250		Base Year		166	66%	3.8%		172	69%	1.0%		174	70%	1.0%		176	70%	0.7%		177	
Providence	DYER STREET 2	4.16	2J1	408	408		Base Year		340	83%	3.8%		353	87%	1.0%		356	87%	1.0%		360	88%	0.7%		363	89%
Providence	DYER STREET 2	4.16	2J10	354	354		Base Year		190	54%	3.8%		197	56%	1.0%		199	56%	1.0%		201	57%	0.7%		203	57%
Providence	DYER STREET 2	4.16	2J2	285	313		Base Year		140	49%	3.8%		145	51%	1.0%		147	51%	1.0%		148	52%	0.7%		149	52%
Providence	DYER STREET 2	4.16	2J3	297	326		Base Year		80	27%	3.8%		83	28%	1.0%		84	28%	1.0%		85	29%	0.7%		85	29%
Providence	DYER STREET 2	4.16	2J4	340	340		Base Year		173	51%	3.8%		180	53%	1.0%		182	53%	1.0%		184	54%	0.7%		185	54%
Providence	DYER STREET 2	4.16	2J5	354	354		Base Year		128	36%	3.8%		133	38%	1.0%		134	38%	1.0%		136	38%	0.7%		136	39%
Providence	DYER STREET 2	4.16	2J7	354	354		Base Year		230	65%	3.8%		239	67%	1.0%		241	68%	1.0%		244	69%	0.7%		245	69%
Providence	DYER STREET 2	4.16	2J8	354	354		Base Year		190	54%	3.8%		197	56%	1.0%		199	56%	1.0%		201	57%	0.7%		203	57%
Providence	DYER STREET 2	4.16	2J9	340	340		Base Year		267	78%	3.8%		277	81%	1.0%		280	82%	1.0%		282	83%	0.7%		284	84%
Providence	EAST GEORGE ST 77	4.16	77J1	371	408		Base Year		263	71%	3.8%		273	74%	1.0%		276	74%	1.0%		279	75%	0.7%		281	76%
Providence	EAST GEORGE ST 77	4.16	77J2	364	495		Base Year		367	101%	3.8%	-50.5	330	91%	1.0%		333	92%	1.0%		337	93%	0.7%		339	93%
Providence	EAST GEORGE ST 77	4.16	77J3	371	385		Base Year		307	83%	3.8%		318	86%	1.0%		321	87%	1.0%		325	88%	0.7%		327	88%
Providence	EAST GEORGE ST 77	4.16	77J4	364	495		Base Year		300	82%	3.8%		311	86%	1.0%		315	86%	1.0%		318	87%	0.7%		320	88%
Providence	ELMWOOD 7 - OUTDOOR	12.47	7F1	530	612		Base Year		384	72%	3.8%		399	75%	1.0%		403	76%	1.0%		407	77%	0.7%		409	77%
Providence	ELMWOOD 7 - OUTDOOR	12.47	7F2	530	612		Base Year		465	88%	3.8%		483	91%	1.0%		487	92%	1.0%		492	93%	0.7%		496	94%
Providence	ELMWOOD 7 - OUTDOOR	12.47	7F4	530	612		Base Year		430	81%	3.8%	25	471	89%	1.0%		476	90%	1.0%		481	91%	0.7%		484	91%
Providence	FRANKLIN SQUARE 11	11.5	1112	280	280		Base Year		63	23%	3.8%		66	23%	1.0%		66	24%	1.0%		67	24%	0.7%		68	24%
Providence	FRANKLIN SQUARE 11	11.5	1121	363	455		Base Year		89	24%	3.8%		92	25%	1.0%		93	26%	1.0%		94	26%	0.7%		95	26%
Providence	FRANKLIN SQUARE 11	11.5	1123	404	404		Base Year		47	12%	3.8%		49	12%	1.0%		50	12%	1.0%		50	12%	0.7%		50	12%
Providence	FRANKLIN SQUARE 11	11.5	1125	696	834		Base Year		196	28%	3.8%		204	29%	1.0%		206	30%	1.0%		208	30%	0.7%		209	30%
Providence	FRANKLIN SQUARE 11	11.5	1126	327	450		Base Year		217	66%	3.8%		226	69%	1.0%		228	70%	1.0%		230	70%	0.7%		232	71%
Providence	FRANKLIN SQUARE 11	11.5	1149	250	250		Base Year		57	23%	3.8%		60	24%	1.0%		60	24%	1.0%		61	24%	0.7%		61	24%
Providence	FRANKLIN SQUARE 11	11.5	1153	313	350		Base Year		164	52%	3.8%		170	54%	1.0%		172	55%	1.0%		173	55%	0.7%		175	56%
Providence	GENEVA 71	4.16	71J1	285	313		Base Year		228	80%	3.8%		237	83%	1.0%		239	84%	1.0%		241	85%	0.7%		243	85%
Providence	GENEVA 71	4.16	71J2	379	408		Base Year		149	39%	3.8%		155	41%	1.0%		157	41%	1.0%		158	42%	0.7%		159	42%
Providence	GENEVA 71	4.16	71J3	379	408		Base Year		188	50%	3.8%		195	51%	1.0%		197	52%	1.0%		199	53%	0.7%		200	53%
Providence	GENEVA 71	4.16	71J4	342	408		Base Year		212	62%	3.8%		220	64%	1.0%		222	65%	1.0%		224	66%	0.7%		226	66%
Providence	GENEVA 71	4.16	71J5	342	408		Base Year		312	91%	3.8%		324	95%	1.0%		327	96%	1.0%		330	97%	0.7%		333	97%
Providence	HARRIS AVENUE 12	11.5	1131	250	250		Base Year		72	29%	3.8%		74	30%	1.0%		75	30%	1.0%		76	30%	0.7%		76	31%
Providence	HARRIS AVENUE 12	4.16	12J1	285	313		Base Year		67	23%	3.8%		69	24%	1.0%		70	25%	1.0%		71	25%	0.7%		71	25%
Providence	HARRIS AVENUE 12	4.16	12J2	379	416		Base Year		260	69%	3.8%		270	71%	1.0%		273	72%	1.0%		275	73%	0.7%		277	73%
Providence	HARRIS AVENUE 12	4.16	12J3	285	313		Base Year		150	53%	3.8%		156	55%	1.0%		157	55%	1.0%		159	56%	0.7%		160	56%
Providence	HARRIS AVENUE 12	4.16	12J4	297	326		Base Year		273	92%	3.8%		284	96%	1.0%		287	96%	1.0%		289	97%	0.7%		291	98%
Providence	HARRIS AVENUE 12	4.16	12J5	297	326		Base Year		100	34%	3.8%		104	35%	1.0%		105	35%	1.0%		106	36%	0.7%		107	36%
Providence	HARRIS AVENUE 12	4.16	12J6	297	326		Base Year		150	51%	3.8%		156	52%	1.0%		157	53%	1.0%		159	53%	0.7%		160	54%
Providence	HUNTINGTON PARK 67	4.16	67J1	354	423		Base Year		256	72%	3.8%		265	75%	1.0%		268	76%	1.0%		271	76%	0.7%		273	77%
Providence	KNIGHTSVILLE 66	4.16	66J1	315	405		Base Year		232	74%	3.8%		241	76%	1.0%		243	77%	1.0%		246	78%	0.7%		247	79%
Providence	KNIGHTSVILLE 66	4.16	66J2	379	408		Base Year		328	87%	3.8%		340	90%	1.0%		344	91%	1.0%		347	92%	0.7%		350	92%
Providence	KNIGHTSVILLE 66	4.16	66J3	379	408		Base Year		348	92%	3.8%		361	95%	1.0%		365	96%	1.0%		368	97%	0.7%		371	98%
Providence	KNIGHTSVILLE 66	4.16	66J4	379	408		Base Year		260	69%	3.8%		270	71%	1.0%		273	72%	1.0%		275	73%	0.7%		277	73%
Providence	KNIGHTSVILLE 66	4.16	66J5	379	408		Base Year		276	73%	3.8%		286	76%	1.0%		289	76%	1.0%		292	77%	0.7%		294	78%
Providence	LIPPITT HILL 79	12.47	79F1	459	579		Base Year		330	72%	3.8%		343	75%	1.0%		346	75%	1.0%		349	76%	0.7%		352	77%
Providence	LIPPITT HILL 79	12.47	79F2	459	579		Base Year		364	79%	3.8%	20	397	87%	1.0%		401	87%	1.0%		405	88%	0.7%		408	89%
Providence	OLNEYVILLE 6	4.16	6J1	306	354		Base Year		188	61%	3.8%		195	64%	1.0%		197	64%	1.0%		199	65%	0.7%		200	66%

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							2011				2012				2013				2014				2015			
Study Area	Substation	Voltage (kV)	Feeder	SN Rating (Amps)	SE Rating (Amps)	Comments	Growth Rate	Spot Loads	Amps	%SN	Growth Rate	Spot Loads	Amps	%SN	Growth Rate	Spot Loads	Amps	%SN	Growth Rate	Spot Loads	Amps	%SN	Growth Rate	Spot Loads	Amps	%SN
Providence	OLNEYVILLE 6	4.16	6J2	306	354		Base Year		219	71%	3.8%		227	74%	1.0%		229	75%	1.0%		232	76%	0.7%		233	76%
Providence	OLNEYVILLE 6	4.16	6J3	306	354		Base Year		117	38%	3.8%		122	40%	1.0%		123	40%	1.0%		124	41%	0.7%		125	41%
Providence	OLNEYVILLE 6	4.16	6J5	306	354		Base Year		108	35%	3.8%		112	37%	1.0%		113	37%	1.0%		114	37%	0.7%		115	38%
Providence	OLNEYVILLE 6	4.16	6J6	306	354		Base Year		138	45%	3.8%		143	47%	1.0%		145	47%	1.0%		146	48%	0.7%		147	48%
Providence	OLNEYVILLE 6	4.16	6J7	306	354		Base Year		212	69%	3.8%		220	72%	1.0%		222	73%	1.0%		224	73%	0.7%		226	74%
Providence	OLNEYVILLE 6	4.16	6J8	306	354		Base Year		65	21%	3.8%		67	22%	1.0%		68	22%	1.0%		69	22%	0.7%		69	23%
Providence	POINT STREET 76	12.47	76F1	484	490		Base Year		418	86%	3.8%		434	90%	1.0%		439	91%	1.0%		443	92%	0.7%		446	92%
Providence	POINT STREET 76	12.47	76F2	500	612		Base Year		421	84%	3.8%		437	87%	1.0%		441	88%	1.0%		445	89%	0.7%		449	90%
Providence	POINT STREET 76	12.47	76F3	546	653		Base Year		232	42%	3.8%		240	44%	1.0%		243	44%	1.0%		245	45%	0.7%		247	45%
Providence	POINT STREET 76	12.47	76F4	530	612		Base Year		518	98%	3.8%	-25	513	97%	1.0%		518	98%	1.0%		523	99%	0.7%		527	99%
Providence	POINT STREET 76	12.47	76F5	448	570		Base Year		501	112%	3.8%	-90	430	96%	1.0%		435	97%	1.0%		439	98%	0.7%		442	99%
Providence	POINT STREET 76	12.47	76F6	518	612		Base Year		390	75%	3.8%	90	495	96%	1.0%		500	97%	1.0%		505	98%	0.7%		509	98%
Providence	POINT STREET 76	12.47	76F7	525	612		Base Year		456	87%	3.8%		473	90%	1.0%		478	91%	1.0%		483	92%	0.7%		486	93%
Providence	POINT STREET 76	12.47	76F8	530	612		Base Year		238	45%	3.8%		247	47%	1.0%		250	47%	1.0%		252	48%	0.7%		254	48%
Providence	ROCHAMBEAU AVENUE 37	4.16	37J1	329	408		Base Year		217	66%	3.8%		225	68%	1.0%		227	69%	1.0%		229	70%	0.7%		231	70%
Providence	ROCHAMBEAU AVENUE 37	4.16	37J2	291	349		Base Year		247	85%	3.8%		256	88%	1.0%		259	89%	1.0%		261	90%	0.7%		263	90%
Providence	ROCHAMBEAU AVENUE 37	4.16	37J3	303	408		Base Year		245	81%	3.8%		254	84%	1.0%		257	85%	1.0%		259	86%	0.7%		261	86%
Providence	ROCHAMBEAU AVENUE 37	4.16	37J4	278	371		Base Year		212	76%	3.8%	50.5	270	97%	1.0%		273	98%	1.0%		276	99%	0.7%		278	100%
Providence	ROCHAMBEAU AVENUE 37	4.16	37J5	347	408		Base Year		232	67%	3.8%		241	69%	1.0%		243	70%	1.0%		246	71%	0.7%		247	71%
Providence	SOUTH STREET 1	11.5	1101	250	250		Base Year		219	87%	3.8%		227	91%	1.0%		229		1.0%		232		0.7%		233	
Providence	SOUTH STREET 1	11.5	1151	322	375		Base Year		230	71%	3.8%		238	74%	1.0%		241	75%	1.0%		243	76%	0.7%		245	76%
Providence	SPRAGUE STREET 36	4.16	36J1	236	283		Base Year		180	76%	3.8%		187	79%	1.0%		189	80%	1.0%		191	81%	0.7%		192	81%
Providence	SPRAGUE STREET 36	4.16	36J2	252	299		Base Year		178	71%	3.8%		185	73%	1.0%		187	74%	1.0%		189	75%	0.7%		190	75%
Providence	SPRAGUE STREET 36	4.16	36J4	344	405		Base Year		237	69%	3.8%		246	71%	1.0%		248	72%	1.0%		251	73%	0.7%		252	73%
Providence	SPRAGUE STREET 36	4.16	36J5	315	315		Base Year		177	56%	3.8%		183	58%	1.0%		185	59%	1.0%		187	59%	0.7%		188	60%
South County East	BONNET 42	12.47	42F1	525	566		Base Year		428	82%	6.7%		457	87%	4.1%		475	91%	4.0%		494	94%	3.1%		510	97%
South County East	LAFAYETTE 30	12.47	30F1	350	385		Base Year		285	81%	6.7%		304	87%	4.1%		317	90%	4.0%	-68	261	75%	3.1%		269	77%
South County East	LAFAYETTE 30	12.47	30F2	546	578		Base Year		344	63%	6.7%		367	67%	4.1%		382	70%	4.0%	53	450	82%	3.1%		464	85%
South County East	OLD BAPTIST ROAD 46	12.47	46F1	530	612		Base Year		396	75%	6.7%		423	80%	4.1%		440	83%	4.0%		457	86%	3.1%		472	89%
South County East	OLD BAPTIST ROAD 46	12.47	46F2	530	612		Base Year		476	90%	6.7%		508	96%	4.1%		529	100%	4.0%	-90	460	87%	3.1%		474	89%
South County East	OLD BAPTIST ROAD 46	12.47	46F3	565	612		Base Year		420	74%	6.7%		448	79%	4.1%		467	83%	4.0%		485	86%	3.1%		500	89%
South County East	OLD BAPTIST ROAD 46	12.47	46F4	594	612		Base Year		392	66%	6.7%		418	70%	4.1%		435	73%	4.0%	50	503	85%	3.1%		518	87%
South County East	PEACEDALE 59	12.47	59F1	409	476		Base Year		145	35%	6.7%		155	38%	4.1%		161	39%	4.0%		168	41%	3.1%		173	42%
South County East	PEACEDALE 59	12.47	59F2	515	515		Base Year		291	57%	6.7%		310	60%	4.1%		323	63%	4.0%		336	65%	3.1%		347	67%
South County East	PEACEDALE 59	12.47	59F3	521	578		Base Year		407	78%	6.7%		434	83%	4.1%		452	87%	4.0%		470	90%	3.1%		485	93%
South County East	PEACEDALE 59	12.47	59F4	409	489		Base Year		154	38%	6.7%		164	40%	4.1%		171	42%	4.0%		178	43%	3.1%		183	45%
South County East	QUONSET 83	12.47	83F1	560	645		Base Year		124	22%	6.7%		132	24%	4.1%		138	25%	4.0%		143	26%	3.1%		148	26%
South County East	QUONSET 83	12.47	83F2	530	650		Base Year		417	79%	6.7%		445	84%	4.1%		463	87%	4.0%	-55	427	81%	3.1%		440	83%
South County East	QUONSET 83	12.47	83F3	560	645		Base Year		189	34%	6.7%		202	36%	4.1%		210	37%	4.0%		218	39%	3.1%		225	40%
South County East	TOWER HILL 88	12.47	88F1	530	650		Base Year		359	68%	6.7%		383	72%	4.1%		399	75%	4.0%		415	78%	3.1%		428	81%
South County East	TOWER HILL 88	12.47	88F3	548	645		Base Year		436	80%	6.7%		465	85%	4.1%		484	88%	4.0%		504	92%	3.1%		519	95%
South County East	TOWER HILL 88	12.47	88F5	530	650		Base Year		517	98%	6.7%		552	104%	4.1%		574	108%	4.0%	-210	387	73%	3.1%		399	75%
South County East	TOWER HILL 88	12.47	88F7	530	650	Expected in-service 2014	Base Year													405	405	76%	3.1%		418	79%
South County East	WAKEFIELD 17	12.47	17F1	602	645	Feeder Upgrade in 2014	Base Year		461	90%	6.7%		492	96%	4.1%		512	99%	4.0%		533	88%	3.1%		549	91%
South County East	WAKEFIELD 17	12.47	17F2	510	510		Base Year		357	70%	6.7%		381	75%	4.1%		397	78%	4.0%		412	81%	3.1%		425	83%
South County East	WAKEFIELD 17	12.47	17F3	597	626		Base Year		427	72%	6.7%		456	76%	4.1%		474	79%	4.0%		493	83%	3.1%		509	85%
South County West	ASHAWAY 43	12.47	43F1	388	423	Planned retire 2014 (Hopkinton related)	Base Year	0	369	95%	6.7%	0	394	101%	4.1%		410	106%	4.0%	-426	0	0%				
South County West	HOPE VALLEY 41	12.47	41F1	347	430	Planned retire 2014 (Hopkinton related)	Base Year	0	281	81%	6.7%	0	300	86%	4.1%		312	90%	4.0%	-325	0	0%				
South County West	HOPKINTON	12.47	F1	515	515	Expected in-service 2014														310	310	60%	3.1%		320	62%
South County West	HOPKINTON	12.47	F2	645	645	Expected in-service 2014														340	340	53%	3.1%		351	54%
South County West	HOPKINTON	12.47	F3	530	650	Expected in-service 2014														440	440	83%	3.1%		454	86%
South County West	HOPKINTON	12.47	F4	645	645	Expected in-service 2014														480	480	74%	3.1%		495	77%
South County West	HOPKINTON	12.47	F5	530	650	Expected in-service 2014														410	410	77%	3.1%		423	80%
South County West	HOPKINTON	12.47	F6	645	645	Expected in-service 2014														430	430	67%	3.1%		443	69%
South County West	HOPKINTON	13.47	F7	315	315	Expected in-service 2014														280	280	89%	3.1%		289	92%
South County West	KENYON 68	12.47	68F1	512	612		Base Year	0	338	66%	6.7%	0	361	70%	4.1%		375	73%	4.0%		390	76%	3.1%		403	79%
South County West	KENYON 68	12.47	68F2	511	612		Base Year	0	415	81%	6.7%	0	443	87%	4.1%		461	90%	4.0%		479	94%	3.1%		494	97%
South County West	KENYON 68	12.47	68F3	512	515		Base Year	0	504	98%	6.7%	0	538	105%	4.1%		560	109%	4.0%	-140	442	86%	3.1%		456	89%
South County West	KENYON 68	12.47	68F4	514	612		Base Year	0	318	62%	6.7%	0	339	66%	4.1%		353	69%	4.0%		367	71%	3.1%		379	74%
South County West	KENYON 68	12.47	68F5	612	612		Base Year	0	282	46%	6.7%	0	301	49%	4.1%		313	51%	4.0%		326	53%	3.1%		336	55%
South County West	LANGWORTHY 86	12.47	86F1	640	648	Limiting element upgraded (transformer) 2014	Base Year	0	319	84%	6.7%	0	340	89%	4.1%		354	93%	4.0%	92	461	72%	3.1%		475	74%
South County West	WESTERLY 16	12.47	16F1	515	515	Planned retire 2014 (Hopkinton related)	Base Year	0	502	97%	6.7%	0	536	104%	4.1%		558	108%	4.0%	-580	0	0%				
South County West	WESTERLY 16	12.47	16F2	515	515	Planned retire 2014 (Hopkinton related)	Base Year	0	433	84%	6.7%	0	462	90%	4.1%		481	93%	4.0%	-500	0	0%				
South County West	WESTERLY 16	12.47	16F3	515	515	Planned retire 2014 (Hopkinton related)	Base Year	0	431	84%	6.7%	0	460	89%	4.1%		479	93%	4.0%	-497	1	0%				
South County West	WESTERLY 16	12.47	16F4	645	645	Planned retire 2014 (Hopkinton related)	Base Year	0	269	42%	6.7%	0	287	44%	4.1%		299	46%	4.0%	-310	1	0%				
Tiverton	TIVERTON	12.47	33F1	478	515		Base Year		304	64%	3.8%		316	66%	1.0%		319	67%	1.0%		322	67%	0.7%		325	68%
Tiverton	TIVERTON	12.47	33F2	456	515		Base Year		337	74%	3.8%		349	77%	1.0%		353	77%	1.0%		356	78%	0.7%		359	79%
Tiverton	TIVERTON	12.47	33F3	478	600		Base Year		399	83%	3.8%		414	87%	1.0%		418	87%	1.0%		422	88%	0.7%		425	89%
Tiverton	TIVERTON	12.47	33F4	456	576		Base Year		439	96%	3.8%		456	100%	1.0%		460	101%	1.0%		465	102%	0.7%		468	103%

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							2016				2017				2018				2019				2020			
Study Area	Substation	Voltage (kV)	Feeder	SN Rating (Amps)	SE Rating (Amps)	Comments	Growth Rate	Spot Loads	Amps	%SN	Growth Rate	Spot Loads	Amps	%SN	Growth Rate	Spot Loads	Amps	%SN	Growth Rate	Spot Loads	Amps	%SN	Growth Rate	Spot Loads	Amps	%SN
Blackstone Valley North	FARNUM	23	105K1	515	515		0.3%		101	20%	0.2%		101	20%	0.1%		102	20%	0.1%		102	20%	0.1%		102	20%
Blackstone Valley North	HIGHLAND DRIVE	13.8	F1	585	585	Estimated in-service 2014	0.3%		311	53%	0.2%		311	53%	0.1%		312	53%	0.1%		312	53%	0.1%		312	53%
Blackstone Valley North	HIGHLAND DRIVE	13.8	F2	585	585	Estimated in-service 2014	0.3%		264	45%	0.2%		265	45%	0.1%		265	45%	0.1%		265	45%	0.1%		266	45%
Blackstone Valley North	HIGHLAND DRIVE	13.8	F3	585	585	Estimated in-service 2014	0.3%		292	50%	0.2%		292	50%	0.1%		292	50%	0.1%		293	50%	0.1%		293	50%
Blackstone Valley North	HIGHLAND DRIVE	13.8	F4	585	585	Estimated in-service 2014	0.3%		32	6%	0.2%		32	6%	0.1%		32	6%	0.1%		32	6%	0.1%		32	6%
Blackstone Valley North	HIGHLAND DRIVE	13.8	F5	515	515	Estimated in-service 2014	0.3%		398	77%	0.2%		398	77%	0.1%		399	77%	0.1%		399	78%	0.1%		400	78%
Blackstone Valley North	HIGHLAND DRIVE	13.8	F6	585	585	Estimated in-service 2014	0.3%		441	75%	0.2%		442	76%	0.1%		442	76%	0.1%		443	76%	0.1%		443	76%
Blackstone Valley North	NASONVILLE	13.8	127W43	585	585		0.3%		320	55%	0.2%		320	55%	0.1%		321	55%	0.1%		321	55%	0.1%		321	55%
Blackstone Valley North	NASONVILLE	13.8	127W40	461	515		0.3%		376	82%	0.2%		377	82%	0.1%		377	82%	0.1%		378	82%	0.1%		378	82%
Blackstone Valley North	NASONVILLE	13.8	127W41	432	515		0.3%		273	63%	0.2%		273	63%	0.1%		274	63%	0.1%		274	63%	0.1%		274	63%
Blackstone Valley North	NASONVILLE	13.8	127W42	458	515		0.3%		320	70%	0.2%		320	70%	0.1%		321	70%	0.1%		321	70%	0.1%		321	70%
Blackstone Valley North	RIVERSIDE 8	13.8	108W51	499	631		0.3%		429	86%	0.2%		430	86%	0.1%		431	86%	0.1%		431	86%	0.1%		432	86%
Blackstone Valley North	RIVERSIDE 8	13.8	108W53	499	631		0.3%		437	88%	0.2%		438	88%	0.1%		438	88%	0.1%		438	88%	0.1%		439	88%
Blackstone Valley North	RIVERSIDE 8	13.8	108W55	474	474		0.3%		34	7%	0.2%		34	7%	0.1%		34	7%	0.1%		35	7%	0.1%		35	7%
Blackstone Valley North	RIVERSIDE 8	13.8	108W60	515	515		0.3%		316	61%	0.2%		317	62%	0.1%		317	62%	0.1%		318	62%	0.1%		318	62%
Blackstone Valley North	RIVERSIDE 8	13.8	108W61	500	500		0.3%		125	25%	0.2%		126	25%	0.1%		126	25%	0.1%		126	25%	0.1%		126	25%
Blackstone Valley North	RIVERSIDE 8	13.8	108W62	515	515		0.3%		270	52%	0.2%		271	53%	0.1%		271	53%	0.1%		271	53%	0.1%		272	53%
Blackstone Valley North	RIVERSIDE 8	13.8	108W63	515	515		0.3%		101	20%	0.2%		101	20%	0.1%		101	20%	0.1%		101	20%	0.1%		101	20%
Blackstone Valley North	RIVERSIDE 8	13.8	108W65	515	515		0.3%		343	67%	0.2%		344	67%	0.1%		344	67%	0.1%		344	67%	0.1%		345	67%
Blackstone Valley North	STAPLES 112	13.8	112W41	515	515		0.3%		127	39%	0.2%		127	39%	0.1%		127	39%	0.1%		128	39%	0.1%		128	39%
Blackstone Valley North	STAPLES 112	13.8	112W42	500	599		0.3%		455	91%	0.2%		456	91%	0.1%		457	91%	0.1%		457	91%	0.1%		458	92%
Blackstone Valley North	STAPLES 112	13.8	112W43	515	515		0.3%		168	45%	0.2%		168	45%	0.1%		168	46%	0.1%		168	46%	0.1%		168	46%
Blackstone Valley North	STAPLES 112	13.8	112W44	406	484		0.3%		402	99%	0.2%		402	99%	0.1%		403	99%	0.1%		403	99%	0.1%		404	99%
Blackstone Valley North	WOONSOCKET	13.8	26W41	515	515	In-Service 2012	0.3%		315	61%	0.2%		316	61%	0.1%		316	61%	0.1%		316	61%	0.1%		317	62%
Blackstone Valley North	WOONSOCKET	13.8	26W42	515	515	In-Service 2012	0.3%		294	57%	0.2%		294	57%	0.1%		295	57%	0.1%		295	57%	0.1%		295	57%
Blackstone Valley North	WOONSOCKET	13.8	26W43	515	515	In-Service 2012	0.3%		474	92%	0.2%		475	92%	0.1%		475	92%	0.1%		475	92%	0.1%		476	92%
Blackstone Valley South	CENTRAL FALLS SUB	4.16	104J1	350	350		0.3%		80	23%	0.2%		80	23%	0.1%		80	23%	0.1%		80	23%	0.1%		80	23%
Blackstone Valley South	CENTRAL FALLS SUB	4.16	104J3	350	350		0.3%		123	35%	0.2%		123	35%	0.1%		124	35%	0.1%		124	35%	0.1%		124	35%
Blackstone Valley South	CENTRAL FALLS SUB	4.16	104J5	350	350		0.3%		170	49%	0.2%		171	49%	0.1%		171	49%	0.1%		171	49%	0.1%		171	49%
Blackstone Valley South	CENTRAL FALLS SUB	4.16	104J7	350	350		0.3%		165	47%	0.2%		166	47%	0.1%		166	47%	0.1%		166	47%	0.1%		166	48%
Blackstone Valley South	CENTRE ST	4.16	106J1	350	350		0.3%		115	33%	0.2%		115	33%	0.1%		115	33%	0.1%		116	33%	0.1%		116	33%
Blackstone Valley South	CENTRE ST	4.16	106J3	350	350		0.3%		161	46%	0.2%		161	46%	0.1%		161	46%	0.1%		162	46%	0.1%		162	46%
Blackstone Valley South	CENTRE ST	4.16	106J7	350	350		0.3%		64	18%	0.2%		64	18%	0.1%		64	18%	0.1%		64	18%	0.1%		64	18%
Blackstone Valley South	COTTAGE STREET SUB	4.16	109J1	408	408		0.3%		333	82%	0.2%		334	82%	0.1%		334	82%	0.1%		334	82%	0.1%		335	82%
Blackstone Valley South	COTTAGE STREET SUB	4.16	109J3	408	408		0.3%		253	62%	0.2%		253	62%	0.1%		254	62%	0.1%		254	62%	0.1%		254	62%
Blackstone Valley South	COTTAGE STREET SUB	4.16	109J5	408	408		0.3%		299	73%	0.2%		300	74%	0.1%		300	74%	0.1%		301	74%	0.1%		301	74%
Blackstone Valley South	CROSSMAN STREET SUB	4.16	111J1	350	350		0.3%		266	76%	0.2%		267	76%	0.1%		267	76%	0.1%		267	76%	0.1%		268	76%
Blackstone Valley South	CROSSMAN STREET SUB	4.16	111J3	350	350		0.3%		180	51%	0.2%		180	51%	0.1%		180	51%	0.1%		180	52%	0.1%		181	52%
Blackstone Valley South	DAGGETT SUB	4.16	113J1	390	390		0.3%		169	43%	0.2%		170	44%	0.1%		170	44%	0.1%		170	44%	0.1%		170	44%
Blackstone Valley South	DAGGETT SUB	4.16	113J2	390	390		0.3%		132	34%	0.2%		132	34%	0.1%		132	34%	0.1%		133	34%	0.1%		133	34%
Blackstone Valley South	FRONT ST. SUB	4.16	24J1	350	350		0.3%		160	46%	0.2%		160	46%	0.1%		160	46%	0.1%		160	46%	0.1%		161	46%
Blackstone Valley South	HYDE SUB	4.16	28J1	400	400		0.3%		117	29%	0.2%		117	29%	0.1%		118	29%	0.1%		118	29%	0.1%		118	29%
Blackstone Valley South	HYDE SUB	4.16	28J2	400	400		0.3%		164	41%	0.2%		164	41%	0.1%		165	41%	0.1%		165	41%	0.1%		165	41%
Blackstone Valley South	LEE STREET SUB	4.16	30J1	380	380		0.3%		213	56%	0.2%		213	56%	0.1%		214	56%	0.1%		214	56%	0.1%		214	56%
Blackstone Valley South	LEE STREET SUB	4.16	30J3	380	380		0.3%		341	90%	0.2%		342	90%	0.1%		342	90%	0.1%		342	90%	0.1%		343	90%
Blackstone Valley South	LEE STREET SUB	4.16	30J5	310	310		0.3%		133	43%	0.2%		133	43%	0.1%		134	43%	0.1%		134	43%	0.1%		134	43%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W1	350	350		0.3%		67	19%	0.2%		67	19%	0.1%		67	19%	0.1%		67	19%	0.1%		67	19%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W2	350	350		0.3%		45	13%	0.2%		45	13%	0.1%		45	13%	0.1%		45	13%	0.1%		45	13%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W3	350	350		0.3%		49	14%	0.2%		49	14%	0.1%		49	14%	0.1%		49	14%	0.1%		49	14%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W43	365	365		0.3%		245	67%	0.2%		246	67%	0.1%		246	67%	0.1%		246	67%	0.1%		246	67%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W49	202	250		0.3%		156	77%	0.2%		156	77%	0.1%		156	77%	0.1%		156	77%	0.1%		156	77%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W50	356	365		0.3%		252	71%	0.2%		253	71%	0.1%		253	71%	0.1%		253	71%	0.1%		254	71%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W51	365	365		0.3%		169	46%	0.2%		170	46%	0.1%		170	47%	0.1%		170	47%	0.1%		170	47%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W53	407	540		0.3%		225	55%	0.2%		225	55%	0.1%		225	55%	0.1%		226	55%	0.1%		226	56%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W60	334	449		0.3%		319	95%	0.2%		319	96%	0.1%		319	96%	0.1%		320	96%	0.1%		320	96%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W61	343	411		0.3%		328	96%	0.2%		329	96%	0.1%		329	96%	0.1%		329	96%	0.1%		330	96%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W62	480	480		0.3%		458	95%	0.2%		459	96%	0.1%		459	96%	0.1%		460	96%	0.1%		460	96%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W63	515	515		0.3%		414	80%	0.2%		415	81%	0.1%		416	81%	0.1%		416	81%	0.1%		416	81%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W65	345	360		0.3%		333	97%	0.2%		334	97%	0.1%		334	97%	0.1%		335	97%	0.1%		335	97%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W66	360	360		0.3%		156	43%	0.2%		156	43%	0.1%		156	43%	0.1%		156	43%	0.1%		156	43%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W80	285	365		0.3%		157	55%	0.2%		157	55%	0.1%		157	55%	0.1%		157	55%	0.1%		157	55%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W81	368	540		0.3%		340	92%	0.2%		340	92%	0.1%		341	93%	0.1%		341	93%	0.1%		341	93%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W83	346	540		0.3%		295	85%	0.2%		296	85%	0.1%		296	86%	0.1%		296	86%	0.1%		297	86%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W84	332	365		0.3%		205	62%	0.2%		205	62%	0.1%		205	62%	0.1%		206	62%	0.1%		206	62%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W85	305	365		0.3%		258	85%	0.2%		258	85%	0.1%		259	85%	0.1%		259	85%	0.1%		259	85%
Blackstone Valley South	PAWTUCKET #2 STATION	4.16	148J1	370	370		0.3%		169	46%	0.2%		169	46%	0.1%		170	46%	0.1%		170	46%	0.1%		170	46%
Blackstone Valley South	PAWTUCKET #2 STATION	4.16	148J3	290	290		0.3%		116	40%	0.2%		117	40%	0.1%		117	40%	0.1%		117	40%	0.1%		117	40%
Blackstone Valley South	PAWTUCKET #2 STATION	4.16	148J5	370	370		0.3%		213	58%	0.2%		213	58%	0.1%		214	58%	0.1%		214	58%	0.1%		214	58%
Blackstone Valley South	PAWTUCKET #2 STATION	4.16	148J7	370	370		0.3%		225	61%	0.2%		225	61%	0.1%		225	61%	0.1%		226	61%	0.1%		226	61%
Blackstone Valley South	SOUTHEAST SUB	4.16	60J1	408	408		0.3%		91	22%	0.2%		91	22%	0.1%		91	22%	0.1%		91	22%	0.1%		91	22%
Blackstone Valley South	SOUTHEAST SUB	4.16	60J3	408	408		0.3%		122	30%	0.2%		122	30%	0.1%		123	30%	0.1%		123	30%	0.1%		123	30%
Blackstone Valley South	SOUTHEAST SUB	4.16	60J5	350	350		0.3%		116	33%	0.2%		117	33%	0.1%		117	33%	0.1%		117	33%	0.1%		117	33%
Blackstone Valley South	VALLEY SUB	13.8	102W41	493	515		0.3%		259	53%	0.2%		259	53%	0.1%		260	53%	0.1%		260	53%	0.1%		260	53%
Blackstone Valley South	VALLEY SUB	13.8	102W42	463	515		0.3%		422	91%	0.2%		423	91%	0.1%		423	91%	0.1%		424	91%	0.1%		424	92%
Blackstone Valley South	VALLEY SUB	13.8	102W44	328	460		0.3%		297	91%	0.2%		298	91%	0.1%		298	91%	0.1%		298	91%	0.1%		299	91%
Blackstone Valley South	VALLEY SUB	13.8	102W50	364	375		0.3%		150	41%	0.2%		151	41%	0.1%		151	41%	0.1%		151	41%	0.1%		151	41%
Blackstone Valley South	VALLEY SUB	13.8	102W51	341	497		0.3%		313	92%	0.2%		314	92%	0.1%		314	92%	0.1%		314	92%	0.1%		315	92%
Blackstone Valley South	VALLEY SUB	13.8	102W52	300	365		0.3%		108	36%	0.2%		108	36%	0.1%		108	36%	0.1%		108	36%	0.1%		108	36%
Blackstone Valley South	VALLEY SUB	13.8	102W54	292	413		0.3%		263	90%	0.2%		264	90%	0.1%		264	90%	0.1%		264	90%	0.1%		264	91%
Blackstone Valley South	WASHINGTON SUB	13.8	126W40	515	645		0.3%		264	51%	0.2%		265	51%	0.1%		265	51%	0.1%		265	52%	0.1%		266	52%
Blackstone Valley South	WASHINGTON SUB	13.8	126W41	520	535		0.3%		453	87%	0.2%		454	87%	0.1%		454	87%	0.1%		455	87%	0.1%		455	88%
Blackstone Valley South	WASHINGTON SUB	13.8	126W42	525	600		0.3%		369	70%	0.2%		369	70%	0.1%		370	70%	0.1%		370	70%	0.1%		370	71%
Blackstone Valley South	WASHINGTON SUB	13.8	126W50	528	645		0.3%		527	100%	0.2%	-74	454	86%	0.1%		455	86%	0.1%		455	86%	0.1%		456	86%

Feeders - Normal Configuration Summary
2012 Annual Planning
Rhode Island Study Areas

							2016				2017				2018				2019				2020			
Study Area	Substation	Voltage (kV)	Feeder	SN Rating (Amps)	SE Rating (Amps)	Comments	Growth Rate	Spot Loads	Amps	%SN	Growth Rate	Spot Loads	Amps	%SN	Growth Rate	Spot Loads	Amps	%SN	Growth Rate	Spot Loads	Amps	%SN	Growth Rate	Spot Loads	Amps	%SN
Blackstone Valley South	WASHINGTON SUB	13.8	126W51	515	515		0.3%		485	94%	0.2%		486	94%	0.1%		486	94%	0.1%		487	94%	0.1%		487	95%
Blackstone Valley South	WASHINGTON SUB	13.8	126W53	583	750		0.3%		23	4%	0.2%		23	4%	0.1%		24	4%	0.1%		24	4%	0.1%		24	4%
Blackstone Valley South	WASHINGTON SUB	13.8	126W54	530	645		0.3%		426	80%	0.2%	74	501	95%	0.1%		501	95%	0.1%		502	95%	0.1%		502	95%
Central RI East	APPONAUG 3	12.47	3F1	510	510		2.5%		445	87%	2.2%		455	89%	2.0%		464	91%	1.9%		473	93%	1.9%		482	95%
Central RI East	APPONAUG 3	12.47	3F2	515	515		2.5%		430	83%	2.2%		439	85%	2.0%		448	87%	1.9%		457	89%	1.9%		465	90%
Central RI East	DRUMROCK 14	12.47	14F1	530	612		2.5%		454	86%	2.2%		464	88%	2.0%		473	89%	1.9%		482	91%	1.9%		492	93%
Central RI East	DRUMROCK 14	12.47	14F2	530	595		2.5%		408	77%	2.2%		417	79%	2.0%		425	80%	1.9%		433	82%	1.9%		441	83%
Central RI East	DRUMROCK 14	12.47	14F3	515	515		2.5%		334	65%	2.2%		342	66%	2.0%		349	68%	1.9%		355	69%	1.9%		362	70%
Central RI East	DRUMROCK 14	12.47	14F4	515	515		2.5%		376	73%	2.2%		385	75%	2.0%		392	76%	1.9%		400	78%	1.9%		407	79%
Central RI East	KILVERT STREET 87	12.47	87F1	530	645		2.5%		459	87%	2.2%		469	88%	2.0%		478	90%	1.9%		487	92%	1.9%		496	94%
Central RI East	KILVERT STREET 87	12.47	87F2	570	662		2.5%		297	52%	2.2%		304	53%	2.0%		310	54%	1.9%		316	55%	1.9%		322	56%
Central RI East	KILVERT STREET 87	12.47	87F3	530	645		2.5%		352	66%	2.2%		360	68%	2.0%		367	69%	1.9%		374	71%	1.9%		381	72%
Central RI East	KILVERT STREET 87	12.47	87F4	530	650		2.5%		365	69%	2.2%		373	70%	2.0%		380	72%	1.9%		387	73%	1.9%		395	75%
Central RI East	KILVERT STREET 87	12.47	87F5	530	650	Expected In-Service 2015	2.5%		410	77%	2.2%		419	79%	2.0%		427	81%	1.9%		436	82%	1.9%		444	84%
Central RI East	KILVERT STREET 87	12.47	87F6	530	650	Expected In-Service 2015	2.5%		256	48%	2.2%		262	49%	2.0%		267	50%	1.9%		272	51%	1.9%		277	52%
Central RI East	LINCOLN AVENUE 72	12.47	72F1	530	650		2.5%		341	64%	2.2%		349	66%	2.0%		356	67%	1.9%		362	68%	1.9%		369	70%
Central RI East	LINCOLN AVENUE 72	12.47	72F2	530	650		2.5%		441	83%	2.2%		451	85%	2.0%		460	87%	1.9%		469	88%	1.9%		477	90%
Central RI East	LINCOLN AVENUE 72	12.47	72F3	530	650		2.5%		404	76%	2.2%		413	78%	2.0%		421	79%	1.9%		429	81%	1.9%		437	82%
Central RI East	LINCOLN AVENUE 72	12.47	72F4	530	650		2.5%		473	89%	2.2%		484	91%	2.0%		493	93%	1.9%		503	95%	1.9%		512	97%
Central RI East	LINCOLN AVENUE 72	12.47	72F5	515	515		2.5%		457	89%	2.2%		467	91%	2.0%		476	92%	1.9%		485	94%	1.9%		494	96%
Central RI East	LINCOLN AVENUE 72	12.47	72F6	645	645		2.5%		398	62%	2.2%		407	63%	2.0%		415	64%	1.9%		423	66%	1.9%		431	67%
Central RI East	PONTIAC 27	12.47	27F1	555	555	Limiting cable element upgraded 2016	2.5%		504	91%	2.2%		515	93%	2.0%		526	95%	1.9%		536	97%	1.9%		546	98%
Central RI East	PONTIAC 27	12.47	27F2	515	515	Limiting cable element upgraded 2016	2.5%		331	64%	2.2%		338	66%	2.0%		345	67%	1.9%		351	68%	1.9%		358	70%
Central RI East	PONTIAC 27	12.47	27F3	460	515		2.5%		219	48%	2.2%		223	48%	2.0%		228	50%	1.9%		232	50%	1.9%		237	52%
Central RI East	PONTIAC 27	12.47	27F4	460	515		2.5%		466	101%	2.2%		477	104%	2.0%		486	106%	1.9%		495	108%	1.9%		505	110%
Central RI East	PONTIAC 27	12.47	27F5	530	650	Limiting cable element upgraded 2016	2.5%		431	81%	2.2%		440	83%	2.0%		449	85%	1.9%		458	86%	1.9%		466	88%
Central RI East	PONTIAC 27	12.47	27F6	530	650	Limiting cable element upgraded 2016	2.5%		639	121%	2.2%		653	123%	2.0%		666	126%	1.9%		679	128%	1.9%		692	131%
Central RI East	WARWICK 52	12.47	52F1	409	476		2.5%		245	60%	2.2%		250	61%	2.0%		255	62%	1.9%		260	64%	1.9%		265	65%
Central RI East	WARWICK 52	12.47	52F2	476	476		2.5%		249	52%	2.2%		255	54%	2.0%		260	55%	1.9%		265	56%	1.9%		270	57%
Central RI East	WARWICK 52	12.47	52F3	526	560	Feeder Upgrade in 2014	2.5%		482	92%	2.2%		492	94%	2.0%		502	95%	1.9%		512	97%	1.9%		522	99%
Central RI West	ANTHONY	12.47	64F1	361	374		2.5%		262	73%	2.2%		268	74%	2.0%		273	76%	1.9%		278	77%	1.9%		283	78%
Central RI West	ANTHONY	12.47	64F2	361	374		2.5%		241	67%	2.2%		246	68%	2.0%		251	70%	1.9%		256	71%	1.9%		261	72%
Central RI West	ARCTIC	4.16	49J1	295	352		2.5%		255	86%	2.2%		261	88%	2.0%		266	90%	1.9%		271	92%	1.9%		276	94%
Central RI West	ARCTIC	4.16	49J2	295	352		2.5%		62	21%	2.2%		64	22%	2.0%		65	22%	1.9%		66	22%	1.9%		67	23%
Central RI West	ARCTIC	4.16	49J3	295	315		2.5%		251	85%	2.2%		257	87%	2.0%		262	89%	1.9%		267	91%	1.9%		272	92%
Central RI West	ARCTIC	4.16	49J4	295	352	Planned retire 2015 - New London Ave Related																				
Central RI West	COVENTRY	12.47	54F1	526	560		2.5%		371	71%	2.2%		379	72%	2.0%		387	74%	1.9%		394	75%	1.9%		402	76%
Central RI West	DIVISION ST	12.47	61F1	450	476		2.5%		421	94%	2.2%		430	96%	2.0%		439	98%	1.9%		447	99%	1.9%		456	101%
Central RI West	DIVISION ST	12.47	61F2	450	476		2.5%		436	97%	2.2%	-25	420	93%	2.0%		429	95%	1.9%		437	97%	1.9%		445	99%
Central RI West	DIVISION ST	12.47	61F3	450	476		2.5%		383	85%	2.2%		392	87%	2.0%		400	89%	1.9%		407	90%	1.9%		415	92%
Central RI West	DIVISION ST	12.47	61F4	450	645		2.5%		425	94%	2.2%		434	96%	2.0%		443	98%	1.9%		451	100%	1.9%		460	102%
Central RI West	HOPE	12.47	15F1	348	394		2.5%		277	80%	2.2%		284	81%	2.0%		289	83%	1.9%		295	85%	1.9%		300	86%
Central RI West	HOPE	12.47	15F2	476	476		2.5%		462	97%	2.2%		472	99%	2.0%		481	101%	1.9%		490	103%	1.9%		500	105%
Central RI West	HOPKINS HILL	12.47	63F1	538	650		2.5%		288	54%	2.2%		294	55%	2.0%		300	56%	1.9%		306	57%	1.9%		312	58%
Central RI West	HOPKINS HILL	12.47	63F2	530	650		2.5%		505	95%	2.2%		516	97%	2.0%		526	99%	1.9%		536	101%	1.9%		547	103%
Central RI West	HOPKINS HILL	12.47	63F3	530	650		2.5%		387	73%	2.2%		395	75%	2.0%		403	76%	1.9%		411	78%	1.9%		419	79%
Central RI West	HOPKINS HILL	12.47	63F4	530	650		2.5%		452	85%	2.2%		462	87%	2.0%		471	89%	1.9%		480	91%	1.9%		489	92%
Central RI West	HOPKINS HILL	12.47	63F5	530	650		2.5%		392	74%	2.2%		400	76%	2.0%		408	77%	1.9%		416	79%	1.9%		424	80%
Central RI West	HOPKINS HILL	12.47	63F6	530	650		2.5%		532	100%	2.2%		544	103%	2.0%		555	105%	1.9%		565	107%	1.9%		576	109%
Central RI West	HUNT RIVER	12.47	40F1	274	327	Planned retire 2017 - Flood Mitigation	2.5%		249	91%	2.2%	-250	0	0%												
Central RI West	KENT COUNTY	12.47	22F1	530	650		2.5%		503	95%	2.2%		514	97%	2.0%		524	99%	1.9%		534	101%	1.9%		544	103%
Central RI West	KENT COUNTY	12.47	22F2	530	650		2.5%		507	96%	2.2%		518	98%	2.0%		528	100%	1.9%		538	102%	1.9%		548	103%
Central RI West	KENT COUNTY	12.47	22F3	530	650		2.5%		352	66%	2.2%		360	68%	2.0%		367	69%	1.9%		374	71%	1.9%		381	72%
Central RI West	KENT COUNTY	12.47	22F4	586	662		2.5%		551	94%	2.2%	-165	398	68%	2.0%		406	69%	1.9%		414	71%	1.9%		422	72%
Central RI West	KENT COUNTY	12.47	22F6	530	650	Expected In-Service 2017				0%	2.2%	440	440	83%	2.0%		449	85%	1.9%		457	86%	1.9%		466	88%
Central RI West	NATICK	12.47	29F1	526	560		2.5%		403	77%	2.2%		412	78%	2.0%		420	80%	1.9%		428	81%	1.9%		436	83%
Central RI West	NATICK	12.47	29F2	408	408		2.5%		396	97%	2.2%		404	99%	2.0%		412	101%	1.9%		420	103%	1.9%		428	105%
Central RI West	TIOGUE AVE	12.47	100F1	570	612	In-Service 2013	2.5%		467	82%	2.2%		477	84%	2.0%		487	85%	1.9%		496	87%	1.9%		506	89%
Central RI West	WARWICK MALL	12.47	28F1	390	412		2.5%		195	50%	2.2%		200	51%	2.0%		204	52%	1.9%		207	53%	1.9%		211	54%
Central RI West	WARWICK MALL	12.47	28F2	390	422		2.5%		146	38%	2.2%		150	38%	2.0%		153	39%	1.9%		156	40%	1.9%		159	41%
Central RI West	NEW LONDON AVE	12.47	150F1	645	645	Expected In-Service 2015	2.5%		359	56%	2.2%		367	57%	2.0%		374	58%	1.9%		381	59%	1.9%		388	60%
Central RI West	NEW LONDON AVE	12.47	150F3	530	650	Expected In-Service 2015	2.5%		297	56%	2.2%		304	57%	2.0%		310	58%	1.9%		316	60%	1.9%		322	61%
Central RI West	NEW LONDON AVE	12.47	150F5	530	650	Expected In-Service 2015	2.5%		333	63%	2.2%		340	64%	2.0%		347	66%	1.9%		354	67%	1.9%		361	68%
Central RI West	NEW LONDON AVE	12.47	150F7	645	645	Expected In-Service 2015	2.5%		256	40%	2.2%		262	41%	2.0%		267	41%	1.9%		272	42%	1.9%		277	43%
East Bay	BARRINGTON 4	12.47	4F1	515	515		0.6%		487	95%	0.4%		489	95%	0.2%		490	95%	0.2%		491	95%	0.1%		491	95%
East Bay	BARRINGTON 4	12.47	4F2	510	510		0.6%		468	92%	0.4%		470	92%	0.2%		471	92%	0.2%		472	93%	0.1%		473	93%
East Bay	BRISTOL 51A	12.47	51F1	502	612		0.6%		468	93%	0.4%		470	94%	0.2%		471	94%	0.2%		472	94%	0.1%		472	94%
East Bay	BRISTOL 51A	12.47	51F2	530	612		0.6%		460	87%	0.4%		462	87%	0.2%		463	87%	0.2%		464	88%	0.1%		464	88%
East Bay	BRISTOL 51A	12.47	51F3	502	612		0.6%		439	88%	0.4%		441	88%	0.2%		442	88%	0.2%		443	88%	0.1%		443	88%
East Bay	KENT CORNERS 47	4.16	47J1	285	313		0.6%		38	13%	0.4%		38	13%	0.2%		38	13%	0.2%		38	13%	0.1%		38	13%
East Bay	KENT CORNERS 47	4.16	47J2	379	408		0.6%		322	85%	0.4%		323	85%	0.2%		324	85%	0.2%		324	86%	0.1%		325	86%
East Bay	KENT CORNERS 47	4.16	47J3	379	408	Upgrade limiting element (regualtors) 2013	0.6%		356	94%	0.4%		358	94%	0.2%		358	95%	0.2%		359	95%	0.1%		359	95%
East Bay	KENT CORNERS 47	4.16	47J4	379	408		0.6%		318	84%	0.4%		319	84%	0.2%		319	84%	0.2%		320	84%	0.1%		320	85%
East Bay	PHILLIPSDALE 20	12.47	20F1	425	450		0.6%		278	65%	0.4%		279	66%	0.2%		279	66%	0.2%		280	66%	0.1%		280	66%
East Bay	PHILLIPSDALE 20	12.47	20F2	425	450		0.6%		332	78%	0.4%		333	78%	0.2%		334	79%	0.2%		334	79%	0.1%		335	79%
East Bay	WAMPANOAG 48	12.47	48F1	502	507		0.6%		483	96%	0.4%		485	97%	0.2%		486	97%	0.2%		487	97%	0.1%		487	97%
East Bay	WAMPANOAG 48	12.47	48F2	515	515		0.6%		399	77%	0.4%		401	78%	0.2%		401	78%	0.2%		402	78%	0.1%		403	78%
East Bay	WAMPANOAG 48	12.47	48F3	510	515		0.6%		493	97%	0.4%		495	97%	0.2%		496	97%	0.2%		497	97%	0.1%		497	97%
East Bay	WAMPANOAG 48	12.47	48F4	530	612		0.6%		495	93%	0.4%		497	94%	0.2%		498	94%	0.2%		499	94%	0.1%		499	94%
East Bay	WAMPANOAG 48	12.47	48F5	485	490		0.6%		443	91%	0.4%		444	92%	0.2%		445	92%	0.2%		446	92%	0.1%		447	92%
East Bay	WAMPANOAG 48	12.47	48F6	530	612		0.6%		452	85%	0.4%		453	86%	0.2%		454	86%	0.2%		455	86%	0.1%		456	86%
East Bay	WARREN 5	12.47	5F1	425	520		0.6%		331	78%	0.4%		333	78%	0.2%		333	78%	0.2%		334	79%	0.1%		334	79%
East Bay	WARREN 5	12.47	5F2	434	434		0.6%		432	100%	0.4%		434	100%	0.2%		435	100%	0.2%		435	100%	0.1%		436	100%

Feeders - Normal Configuration Summary
2012 Annual Planning
Rhode Island Study Areas

							2016				2017				2018				2019				2020			
Study Area	**Substation**	**Voltage (kV)**	**Feeder**	**SN Rating (Amps)**	**SE Rating (Amps)**	**Comments**	**Growth Rate**	**Spot Loads**	**Amps**	**%SN**	**Growth Rate**	**Spot Loads**	**Amps**	**%SN**	**Growth Rate**	**Spot Loads**	**Amps**	**%SN**	**Growth Rate**	**Spot Loads**	**Amps**	**%SN**	**Growth Rate**	**Spot Loads**	**Amps**	**%SN**
East Bay	WARREN 5	12.47	5F3	515	515		0.6%		380	74%	0.4%		382	74%	0.2%		382	74%	0.2%		383	74%	0.1%		384	74%
East Bay	WARREN 5	12.47	5F4	510	510		0.6%		461	90%	0.4%		463	91%	0.2%		464	91%	0.2%		465	91%	0.1%		465	91%
East Bay	WATERMAN AVENUE 78	12.47	78F3	409	489		0.6%		350	85%	0.4%		351	86%	0.2%		352	86%	0.2%		352	86%	0.1%		353	86%
East Bay	WATERMAN AVENUE 78	12.47	78F4	409	489		0.6%		292	71%	0.4%		293	72%	0.2%		294	72%	0.2%		294	72%	0.1%		294	72%
Newport	BAILEY BROOK	4.16	19J14	476	476	Planned retire 2015 (Newport related)																				
Newport	BAILEY BROOK	4.16	19J16	476	476	Planned retire 2015 (Newport related)																				
Newport	BAILEY BROOK	4.16	19J2	447	476	Planned retire 2015 (Newport related)																				
Newport	CLARKE STREET	4.16	65J12	575	575	Planned Upgrade 2015	2.2%		412	72%	1.9%		420	73%	1.7%		427	74%	1.6%		434	75%	1.6%		441	77%
Newport	CLARKE STREET	4.16	65J2	570	595		2.2%		475	83%	1.9%		484	85%	1.7%		492	86%	1.6%		500	88%	1.6%		508	89%
Newport	DEXTER	13.8	36W41	464	566		2.2%		384	83%	1.9%		392	84%	1.7%		398	86%	1.6%		405	87%	1.6%		411	89%
Newport	DEXTER	13.8	36W42	464	515		2.2%		246	53%	1.9%		251	54%	1.7%		255	55%	1.6%		259	56%	1.6%		263	57%
Newport	DEXTER	13.8	36W43	464	566		2.2%		177	38%	1.9%		180	39%	1.7%		183	40%	1.6%		186	40%	1.6%		189	41%
Newport	DEXTER	13.8	36W44	464	566		2.2%		330	71%	1.9%		336	72%	1.7%		342	74%	1.6%		347	75%	1.6%		353	76%
Newport	ELDRED	4.16	45J2	448	476	Planned retire 2015																				
Newport	ELDRED	4.16	45J4	340	340	Planned retire 2015																				
Newport	ELDRED	4.16	45J6	448	476	Planned retire 2015																				
Newport	ELDRED NEW	4.16	45J1	530	600	Expected in-service 2015	2.2%		409	77%	1.9%		417	79%	1.7%		424	80%	1.6%		430	81%	1.6%		437	83%
Newport	ELDRED NEW	4.16	45J2	530	600	Expected in-service 2015	2.2%		315	59%	1.9%		321	61%	1.7%		326	62%	1.6%		331	63%	1.6%		337	64%
Newport	GATE II	4.16	38J2	440	476	Planned retire 2015 (Newport related)																				
Newport	GATE II	4.16	38J4	440	476	Planned retire 2015 (Newport related)																				
Newport	HARRISON	4.16	32J12	530	540		2.2%		382	72%	1.9%		390	74%	1.7%		396	75%	1.6%		403	76%	1.6%		409	77%
Newport	HARRISON	4.16	32J14	366	500		2.2%		343	94%	1.9%		350	96%	1.7%		355	97%	1.6%		361	99%	1.6%		367	100%
Newport	HARRISON	4.16	32J2	350	420		2.2%		264	75%	1.9%		269	77%	1.7%		274	78%	1.6%		278	79%	1.6%		283	81%
Newport	HARRISON	4.16	32J4	300	380		2.2%		143	48%	1.9%		146	49%	1.7%		149	50%	1.6%		151	50%	1.6%		153	51%
Newport	HOSPITAL	4.16	146J12	434	434		2.2%		164	38%	1.9%		167	38%	1.7%		170	39%	1.6%		172	40%	1.6%		175	40%
Newport	HOSPITAL	4.16	146J14	307	365		2.2%		143	47%	1.9%		146	48%	1.7%		149	48%	1.6%		151	49%	1.6%		153	50%
Newport	HOSPITAL	4.16	146J2	300	357		2.2%		147	49%	1.9%		150	50%	1.7%		153	51%	1.6%		155	52%	1.6%		157	52%
Newport	HOSPITAL	4.16	146J4	434	434		2.2%		233	54%	1.9%		237	55%	1.7%		242	56%	1.6%		245	57%	1.6%		249	57%
Newport	JEPSON	4.16	37J2	380	380	Planned retire 2015 (Newport related)																				
Newport	JEPSON	4.16	37J4	380	380	Planned retire 2015 (Newport related)																				
Newport	JEPSON	13.8	37W41	560	560		2.2%		216	39%	1.9%		220	39%	1.7%		224	40%	1.6%		227	41%	1.6%		231	41%
Newport	JEPSON	13.8	37W42	560	560		2.2%		389	69%	1.9%		396	71%	1.7%		403	72%	1.6%		409	73%	1.6%		416	74%
Newport	JEPSON	13.8	37W43	560	560		2.2%		357	64%	1.9%		364	65%	1.7%		370	66%	1.6%		376	67%	1.6%		382	68%
Newport	KINGSTON	4.16	131J12	380	380		2.2%		308	81%	1.9%		314	83%	1.7%		320	84%	1.6%		325	85%	1.6%		330	87%
Newport	KINGSTON	4.16	131J14	307	365		2.2%		265	86%	1.9%		270	88%	1.7%		275	90%	1.6%		279	91%	1.6%		284	92%
Newport	KINGSTON	4.16	131J2	397	510		2.2%		348	88%	1.9%		354	89%	1.7%		360	91%	1.6%		366	92%	1.6%		372	94%
Newport	KINGSTON	4.16	131J4	510	510		2.2%		312	61%	1.9%		318	62%	1.7%		324	63%	1.6%		329	64%	1.6%		334	66%
Newport	KINGSTON	4.16	131J6	380	380		2.2%		54	14%	1.9%		55	15%	1.7%		56	15%	1.6%		57	15%	1.6%		58	15%
Newport	MERTON	4.16	51J12	356	408		2.2%		143	40%	1.9%		146	41%	1.7%		149	42%	1.6%		151	42%	1.6%		153	43%
Newport	MERTON	4.16	51J14	310	368		2.2%		153	49%	1.9%		156	50%	1.7%		159	51%	1.6%		161	52%	1.6%		164	53%
Newport	MERTON	4.16	51J16	380	380		2.2%		287	75%	1.9%		292	77%	1.7%		297	78%	1.6%		302	79%	1.6%		307	81%
Newport	MERTON	4.16	51J2	310	333		2.2%		280	90%	1.9%		285	92%	1.7%		290	94%	1.6%		295	95%	1.6%		299	97%
Newport	NEWPORT SUB	13.8	W1	530	600	Expected in-service 2015	2.2%		270	51%	1.9%		275	52%	1.7%		280	53%	1.6%		284	54%	1.6%		289	54%
Newport	NEWPORT SUB	13.8	W2	530	600	Expected in-service 2015	2.2%		309	58%	1.9%		315	59%	1.7%		320	60%	1.6%		325	61%	1.6%		330	62%
Newport	NEWPORT SUB	13.8	W3	530	600	Expected in-service 2015	2.2%		292	55%	1.9%		298	56%	1.7%		303	57%	1.6%		308	58%	1.6%		313	59%
Newport	NEWPORT SUB	13.8	W4	530	600	Expected in-service 2015	2.2%		416	78%	1.9%		424	80%	1.7%		431	81%	1.6%		438	83%	1.6%		445	84%
Newport	NEWPORT SUB	13.8	W5	530	600	Expected in-service 2015	2.2%		213	40%	1.9%		217	41%	1.7%		220	42%	1.6%		224	42%	1.6%		227	43%
Newport	NO. AQUIDNECK	4.16	21J2	480	480		2.2%		181	38%	1.9%		184	38%	1.7%		187	39%	1.6%		190	40%	1.6%		193	40%
Newport	NO. AQUIDNECK	4.16	21J4	480	480		2.2%		340	71%	1.9%		347	72%	1.7%		353	73%	1.6%		358	75%	1.6%		364	76%
Newport	NO. AQUIDNECK	4.16	21J6	480	480	Planned retire 2015 (Newport related)																				
Newport	SO. AQUIDNECK	4.16	122J2	481	510		2.2%		430	89%	1.9%		438	91%	1.7%		446	93%	1.6%		453	94%	1.6%		460	96%
Newport	SO. AQUIDNECK	4.16	122J4	480	510		2.2%		232	48%	1.9%		237	49%	1.7%		241	50%	1.6%		245	51%	1.6%		249	52%
Newport	SO. AQUIDNECK	4.16	122J6	480	480	Planned retire 2015 (Newport related)																				
Newport	VERNON	4.16	23J12	384	408	Planned retire 2015 (Newport related)																				
Newport	VERNON	4.16	23J14	384	408	Planned retire 2015 (Newport related)																				
Newport	VERNON	4.16	23J2	384	408	Planned retire 2015 (Newport related)																				
Newport	VERNON	4.16	23J4	384	408	Planned retire 2015 (Newport related)																				
Newport	VERNON	4.16	23J6	384	408	Planned retire 2015 (Newport related)																				
Newport	WEST HOWARD	4.16	154J14	290	350		2.2%		247	85%	1.9%		251	87%	1.7%		256	88%	1.6%		260	90%	1.6%		264	91%
Newport	WEST HOWARD	4.16	154J16	270	340		2.2%		244	91%	1.9%		249	92%	1.7%		253	94%	1.6%		257	95%	1.6%		261	97%
Newport	WEST HOWARD	4.16	154J18	380	380		2.2%		344	91%	1.9%		351	92%	1.7%		357	94%	1.6%		362	95%	1.6%		368	97%
Newport	WEST HOWARD	4.16	154J2	480	688		2.2%		350	73%	1.9%		357	74%	1.7%		363	76%	1.6%		368	77%	1.6%		374	78%
Newport	WEST HOWARD	4.16	154J4	290	350		2.2%		252	87%	1.9%		257	88%	1.7%		261	90%	1.6%		265	91%	1.6%		269	93%
Newport	WEST HOWARD	4.16	154J6	268	346		2.2%		236	88%	1.9%		241	90%	1.7%		245	91%	1.6%		249	93%	1.6%		253	94%
Newport	WEST HOWARD	4.16	154J8	380	380		2.2%		330	87%	1.9%		336	88%	1.7%		342	90%	1.6%		347	91%	1.6%		353	93%
North Central RI	CENTREDALE 50	12.47	50F2	367	386		2.3%		255	70%	2.2%		261	71%	2.0%		266	73%	1.9%		271	74%	1.9%		276	75%
North Central RI	CENTREDALE 50	4.16	50J1	285	313		2.3%		186	65%	2.2%		190	67%	2.0%		194	68%	1.9%		197	69%	1.9%		201	71%
North Central RI	CENTREDALE 50	4.16	50J2	295	352		2.3%		0	0%	2.2%		0	0%	2.0%		0	0%	1.9%		0	0%	1.9%		0	0%
North Central RI	CENTREDALE 50	4.16	50J3	408	408		2.3%		279	68%	2.2%		285	70%	2.0%		290	71%	1.9%		296	73%	1.9%		302	74%
North Central RI	CHOPMIST 34	12.47	34F1	530	544		2.3%		512	97%	2.2%	-75	448	85%	2.0%		457	86%	1.9%		466	88%	1.9%		475	90%
North Central RI	CHOPMIST 34	12.47	34F2	415	415		2.3%		356	86%	2.2%		363	88%	2.0%		371	89%	1.9%		378	91%	1.9%		385	93%
North Central RI	CHOPMIST 34	12.47	34F3	385	385		2.3%		315	82%	2.2%		322	84%	2.0%		329	85%	1.9%		335	87%	1.9%		341	89%
North Central RI	FARNUM PIKE 23	12.47	23F1	530	650		2.3%		403	76%	2.2%		412	78%	2.0%		420	79%	1.9%		428	81%	1.9%		436	82%
North Central RI	FARNUM PIKE 23	12.47	23F2	515	515		2.3%		455	88%	2.2%		465	90%	2.0%		474	92%	1.9%		483	94%	1.9%		492	96%
North Central RI	FARNUM PIKE 23	12.47	23F3	530	640		2.3%		525	99%	2.2%	-174	363	68%	2.0%		370	70%	1.9%		377	71%	1.9%		384	73%
North Central RI	FARNUM PIKE 23	12.47	23F4	530	612		2.3%		327	62%	2.2%		335	63%	2.0%		341	64%	1.9%		348	66%	1.9%		354	67%
North Central RI	FARNUM PIKE 23	12.47	23F5	515	515		2.3%		139	27%	2.2%		142	28%	2.0%		145	28%	1.9%		148	29%	1.9%		151	29%
North Central RI	FARNUM PIKE 23	12.47	23F6	515	515		2.3%		446	87%	2.2%		456	89%	2.0%		465	90%	1.9%		474	92%	1.9%		483	94%
North Central RI	JOHNSTON 18	12.47	18F1	526	626		2.3%	72	420	80%	2.2%		429	82%	2.0%	-150	288	55%	1.9%		293	56%	1.9%	157	456	87%
North Central RI	JOHNSTON 18	12.47	18F10	530	612	Expected in-service 2013	2.3%		489	92%	2.2%		500	94%	2.0%		510	96%	1.9%		519	98%	1.9%	-157	372	70%
North Central RI	JOHNSTON 18	12.47	18F2	452	515		2.3%		381	84%	2.2%		390	86%	2.0%		397	88%	1.9%		405	90%	1.9%		413	91%
North Central RI	JOHNSTON 18	12.47	18F3	515	515		2.3%		371	72%	2.2%		379	74%	2.0%		386	75%	1.9%		394	76%	1.9%		401	78%
North Central RI	JOHNSTON 18	12.47	18F4	530	560		2.3%		303	57%	2.2%		310	58%	2.0%		316	60%	1.9%		322	61%	1.9%		328	62%

Feeders - Normal Configuration Summary
2012 Annual Planning
Rhode Island Study Areas

							2016				2017				2018				2019				2020			
Study Area	Substation	Voltage (kV)	Feeder	SN Rating (Amps)	SE Rating (Amps)	Comments	Growth Rate	Spot Loads	Amps	%SN	Growth Rate	Spot Loads	Amps	%SN	Growth Rate	Spot Loads	Amps	%SN	Growth Rate	Spot Loads	Amps	%SN	Growth Rate	Spot Loads	Amps	%SN
North Central RI	JOHNSTON 18	12.47	18F5	530	612		2.3%		414	78%	2.2%		423	80%	2.0%		431	81%	1.9%		439	83%	1.9%		448	84%
North Central RI	JOHNSTON 18	12.47	18F6	515	515		2.3%		511	99%	2.2%		522	101%	2.0%	-198	334	65%	1.9%		341	66%	1.9%		347	67%
North Central RI	JOHNSTON 18	12.47	18F7	530	612		2.3%	75	394	74%	2.2%		402	76%	2.0%		410	77%	1.9%		418	79%	1.9%		426	80%
North Central RI	JOHNSTON 18	12.47	18F8	530	612		2.3%		419	79%	2.2%		429	81%	2.0%	-99	338	64%	1.9%		345	65%	1.9%		351	66%
North Central RI	JOHNSTON 18	12.47	18F9	530	612		2.3%		480	91%	2.2%		491	93%	2.0%		501	94%	1.9%		510	96%	1.9%		520	98%
North Central RI	MANTON 69	12.47	69F1	515	515		2.3%		421	82%	2.2%		430	84%	2.0%		439	85%	1.9%		447	87%	1.9%		456	89%
North Central RI	MANTON 69	12.47	69F3	502	515		2.3%	-100	403	80%	2.2%		412	82%	2.0%		420	84%	1.9%		428	85%	1.9%		436	87%
North Central RI	PUTNAM PIKE 38	12.47	38F1	530	650		2.3%		447	84%	2.2%		456	86%	2.0%		465	88%	1.9%		474	89%	1.9%		483	91%
North Central RI	PUTNAM PIKE 38	12.47	38F2	530	650		2.3%		357	67%	2.2%		365	69%	2.0%		373	70%	1.9%		380	72%	1.9%		387	73%
North Central RI	PUTNAM PIKE 38	12.47	38F3	530	650		2.3%		488	92%	2.2%		498	94%	2.0%		508	96%	1.9%		518	98%	1.9%	-86	442	83%
North Central RI	PUTNAM PIKE 38	12.47	38F4	515	515		2.3%		227	44%	2.2%		232	45%	2.0%		237	46%	1.9%		241	47%	1.9%	62	308	60%
North Central RI	PUTNAM PIKE 38	12.47	38F5	530	612		2.3%		469	89%	2.2%		480	90%	2.0%	-54	435	82%	1.9%		443	84%	1.9%		452	85%
North Central RI	PUTNAM PIKE 38	12.47	38F6	530	612		2.3%		430	81%	2.2%		440	83%	2.0%		448	85%	1.9%		457	86%	1.9%		466	88%
North Central RI	SHUNPIKE SIMS	13.2	35F8	700	765	Expected in-service 2014	2.3%		504	72%	2.2%		515	74%	2.0%		526	75%	1.9%		536	77%	1.9%		546	78%
North Central RI	SHUNPIKE 35	12.47	35F1	543	727	Expected in-service 2018									2.0%	200	200	37%	1.9%		204	38%	1.9%		208	38%
North Central RI	SHUNPIKE 35	12.47	35F2	538	698	Expected in-service 2018									2.0%	193	193	36%	1.9%		197	37%	1.9%		200	37%
North Central RI	SHUNPIKE 35	12.47	35F3	510	694	Expected in-service 2018									2.0%	164	164	32%	1.9%		167	33%	1.9%		170	33%
North Central RI	WEST CRANSTON 21	12.47	21F1	515	515		2.3%	-72	452	88%	2.2%		462	90%	2.0%	-56	415	81%	1.9%		423	82%	1.9%		431	84%
North Central RI	WEST CRANSTON 21	12.47	21F2	515	515		2.3%		479	93%	2.2%		490	95%	2.0%		499	97%	1.9%		509	99%	1.9%		518	101%
North Central RI	WEST CRANSTON 21	12.47	21F4	515	515		2.3%	-75	448	87%	2.2%		458	89%	2.0%		467	91%	1.9%		476	92%	1.9%		485	94%
North Central RI	WEST GREENVILLE 45	12.47	45F2	425	520		2.3%		137	32%	2.2%		140	33%	2.0%		143	34%	1.9%		145	34%	1.9%		148	35%
Providence	ADMIRAL STREET 9	11.5	1115	250	250		0.6%		54		0.4%		54		0.2%		54		0.2%		54		0.1%		54	
Providence	ADMIRAL STREET 9	11.5	1117	250	250		0.6%		172		0.4%		172		0.2%		173		0.2%		173		0.1%		173	
Providence	ADMIRAL STREET 9	11.5	1119	250	250		0.6%		82		0.4%		83		0.2%		83		0.2%		83		0.1%		83	
Providence	ADMIRAL STREET 9	4.16	9J1	297	326		0.6%		290	98%	0.4%		291	98%	0.2%		291	98%	0.2%		292	98%	0.1%		292	98%
Providence	ADMIRAL STREET 9	4.16	9J2	369	441		0.6%		172	47%	0.4%		172	47%	0.2%		173	47%	0.2%		173	47%	0.1%		173	47%
Providence	ADMIRAL STREET 9	4.16	9J3	255	255		0.6%		209	82%	0.4%		209	82%	0.2%		210	82%	0.2%		210	82%	0.1%		211	83%
Providence	ADMIRAL STREET 9	4.16	9J5	297	326		0.6%		164	55%	0.4%		165	55%	0.2%		165	56%	0.2%		165	56%	0.1%		166	56%
Providence	CLARKSON STREET 13	12.47	13F1	400	533		0.6%		316	79%	0.4%		317	79%	0.2%		318	79%	0.2%		318	80%	0.1%		319	80%
Providence	CLARKSON STREET 13	12.47	13F10	400	533	Expeted in-service 2013	0.6%		252	63%	0.4%		253	63%	0.2%		253	63%	0.2%		254	63%	0.1%		254	63%
Providence	CLARKSON STREET 13	12.47	13F2	540	612		0.6%	100	483	89%	0.4%		485	90%	0.2%		486	90%	0.2%		487	90%	0.1%		487	90%
Providence	CLARKSON STREET 13	12.47	13F3	425	612		0.6%		407	96%	0.4%		409	96%	0.2%		410	96%	0.2%		410	97%	0.1%		411	97%
Providence	CLARKSON STREET 13	12.47	13F4	520	612		0.6%		508	98%	0.4%		510	98%	0.2%		512	98%	0.2%		513	99%	0.1%		513	99%
Providence	CLARKSON STREET 13	12.47	13F5	455	612		0.6%		359	79%	0.4%		361	79%	0.2%		362	79%	0.2%		362	80%	0.1%		363	80%
Providence	CLARKSON STREET 13	12.47	13F6	415	542		0.6%		227	55%	0.4%		228	55%	0.2%		229	55%	0.2%		229	55%	0.1%		229	55%
Providence	CLARKSON STREET 13	12.47	13F7	436	571		0.6%		269	62%	0.4%		270	62%	0.2%		271	62%	0.2%		271	62%	0.1%		272	62%
Providence	CLARKSON STREET 13	12.47	13F8	437	563		0.6%		299	68%	0.4%		300	69%	0.2%		300	69%	0.2%		301	69%	0.1%		301	69%
Providence	CLARKSON STREET 13	12.47	13F9	530	612		0.6%		497	94%	0.4%		499	94%	0.2%		500	94%	0.2%		501	95%	0.1%		502	95%
Providence	DYER STREET 2	11.5	1103	250	250		0.6%		178		0.4%		179		0.2%		179		0.2%		180		0.1%		180	
Providence	DYER STREET 2	4.16	2J1	408	408		0.6%		365	89%	0.4%		366	90%	0.2%		367	90%	0.2%		368	90%	0.1%		368	90%
Providence	DYER STREET 2	4.16	2J10	354	354		0.6%		204	58%	0.4%		205	58%	0.2%		205	58%	0.2%		205	58%	0.1%		206	58%
Providence	DYER STREET 2	4.16	2J2	285	313		0.6%		150	53%	0.4%		151	53%	0.2%		151	53%	0.2%		151	53%	0.1%		152	53%
Providence	DYER STREET 2	4.16	2J3	297	326		0.6%		86	29%	0.4%		86	29%	0.2%		86	29%	0.2%		87	29%	0.1%		87	29%
Providence	DYER STREET 2	4.16	2J4	340	340		0.6%		186	55%	0.4%		187	55%	0.2%		187	55%	0.2%		187	55%	0.1%		188	55%
Providence	DYER STREET 2	4.16	2J5	354	354		0.6%		137	39%	0.4%		138	39%	0.2%		138	39%	0.2%		138	39%	0.1%		139	39%
Providence	DYER STREET 2	4.16	2J7	354	354		0.6%		247	70%	0.4%		248	70%	0.2%		248	70%	0.2%		249	70%	0.1%		249	70%
Providence	DYER STREET 2	4.16	2J8	354	354		0.6%		204	58%	0.4%		205	58%	0.2%		205	58%	0.2%		205	58%	0.1%		206	58%
Providence	DYER STREET 2	4.16	2J9	340	340		0.6%		286	84%	0.4%		287	84%	0.2%		288	85%	0.2%		288	85%	0.1%		289	85%
Providence	EAST GEORGE ST 77	4.16	77J1	371	408		0.6%		282	76%	0.4%		284	76%	0.2%		284	77%	0.2%		285	77%	0.1%		285	77%
Providence	EAST GEORGE ST 77	4.16	77J2	364	495		0.6%		341	94%	0.4%		342	94%	0.2%		343	94%	0.2%		344	94%	0.1%		344	95%
Providence	EAST GEORGE ST 77	4.16	77J3	371	385		0.6%		329	89%	0.4%		330	89%	0.2%		331	89%	0.2%		332	89%	0.1%		332	89%
Providence	EAST GEORGE ST 77	4.16	77J4	364	495		0.6%		322	88%	0.4%		323	89%	0.2%		324	89%	0.2%		324	89%	0.1%		325	89%
Providence	ELMWOOD 7 - OUTDOOR	12.47	7F1	530	612		0.6%		412	78%	0.4%		414	78%	0.2%		414	78%	0.2%		415	78%	0.1%		416	78%
Providence	ELMWOOD 7 - OUTDOOR	12.47	7F2	530	612		0.6%		499	94%	0.4%		501	94%	0.2%		502	95%	0.2%		503	95%	0.1%		503	95%
Providence	ELMWOOD 7 - OUTDOOR	12.47	7F4	530	612		0.6%		487	92%	0.4%		489	92%	0.2%		490	92%	0.2%		491	93%	0.1%		491	93%
Providence	FRANKLIN SQUARE 11	11.5	1112	280	280		0.6%		68	24%	0.4%		68	24%	0.2%		68	24%	0.2%		68	24%	0.1%		69	24%
Providence	FRANKLIN SQUARE 11	11.5	1121	363	455		0.6%		95	26%	0.4%		95	26%	0.2%		96	26%	0.2%		96	26%	0.1%		96	26%
Providence	FRANKLIN SQUARE 11	11.5	1123	404	404		0.6%		51	13%	0.4%		51	13%	0.2%		51	13%	0.2%		51	13%	0.1%		51	13%
Providence	FRANKLIN SQUARE 11	11.5	1125	696	834		0.6%		211	30%	0.4%		211	30%	0.2%		212	30%	0.2%		212	31%	0.1%		212	31%
Providence	FRANKLIN SQUARE 11	11.5	1126	327	450		0.6%		233	71%	0.4%		234	72%	0.2%		235	72%	0.2%		235	72%	0.1%		235	72%
Providence	FRANKLIN SQUARE 11	11.5	1149	250	250		0.6%		61	25%	0.4%		62	25%	0.2%		62	25%	0.2%		62	25%	0.1%		62	25%
Providence	FRANKLIN SQUARE 11	11.5	1153	313	350		0.6%		176	56%	0.4%		176	56%	0.2%		177	56%	0.2%		177	57%	0.1%		177	57%
Providence	GENEVA 71	4.16	71J1	285	313		0.6%		245	86%	0.4%		246	86%	0.2%		246	86%	0.2%		247	87%	0.1%		247	87%
Providence	GENEVA 71	4.16	71J2	379	408		0.6%		160	42%	0.4%		161	42%	0.2%		161	43%	0.2%		161	43%	0.1%		162	43%
Providence	GENEVA 71	4.16	71J3	379	408		0.6%		202	53%	0.4%		202	53%	0.2%		203	54%	0.2%		203	54%	0.1%		203	54%
Providence	GENEVA 71	4.16	71J4	342	408		0.6%		227	66%	0.4%		228	67%	0.2%		229	67%	0.2%		229	67%	0.1%		229	67%
Providence	GENEVA 71	4.16	71J5	342	408		0.6%		335	98%	0.4%		336	98%	0.2%		337	98%	0.2%		337	99%	0.1%		338	99%
Providence	HARRIS AVENUE 12	11.5	1131	250	250		0.6%		77	31%	0.4%		77	31%	0.2%		77	31%	0.2%		77	31%	0.1%		78	31%
Providence	HARRIS AVENUE 12	4.16	12J1	285	313		0.6%		72	25%	0.4%		72	25%	0.2%		72	25%	0.2%		72	25%	0.1%		72	25%
Providence	HARRIS AVENUE 12	4.16	12J2	379	416		0.6%		279	74%	0.4%		280	74%	0.2%		281	74%	0.2%		281	74%	0.1%		281	74%
Providence	HARRIS AVENUE 12	4.16	12J3	285	313		0.6%		161	56%	0.4%		162	57%	0.2%		162	57%	0.2%		162	57%	0.1%		162	57%
Providence	HARRIS AVENUE 12	4.16	12J4	297	326		0.6%		293	99%	0.4%		294	99%	0.2%		295	99%	0.2%		296	100%	0.1%		296	100%
Providence	HARRIS AVENUE 12	4.16	12J5	297	326		0.6%		107	36%	0.4%		108	36%	0.2%		108	36%	0.2%		108	36%	0.1%		108	36%
Providence	HARRIS AVENUE 12	4.16	12J6	297	326		0.6%		161	54%	0.4%		162	54%	0.2%		162	55%	0.2%		162	55%	0.1%		162	55%
Providence	HUNTINGTON PARK 67	4.16	67J1	354	423		0.6%		274	77%	0.4%		275	78%	0.2%		276	78%	0.2%		276	78%	0.1%		277	78%
Providence	KNIGHTSVILLE 66	4.16	66J1	315	405		0.6%		249	79%	0.4%		250	79%	0.2%		250	79%	0.2%		251	80%	0.1%		251	80%
Providence	KNIGHTSVILLE 66	4.16	66J2	379	408		0.6%		352	93%	0.4%		353	93%	0.2%		354	93%	0.2%		355	94%	0.1%		355	94%
Providence	KNIGHTSVILLE 66	4.16	66J3	379	408		0.6%		373	98%	0.4%		375	99%	0.2%		376	99%	0.2%		376	99%	0.1%		377	99%
Providence	KNIGHTSVILLE 66	4.16	66J4	379	408		0.6%		279	74%	0.4%		280	74%	0.2%		281	74%	0.2%		281	74%	0.1%		281	74%
Providence	KNIGHTSVILLE 66	4.16	66J5	379	408		0.6%		296	78%	0.4%		297	78%	0.2%		298	79%	0.2%		298	79%	0.1%		299	79%
Providence	LIPPITT HILL 79	12.47	79F1	459	579		0.6%		354	77%	0.4%		355	77%	0.2%		356	78%	0.2%		357	78%	0.1%		357	78%
Providence	LIPPITT HILL 79	12.47	79F2	459	579		0.6%		411	89%	0.4%		412	90%	0.2%		413	90%	0.2%		414	90%	0.1%		414	90%
Providence	OLNEYVILLE 6	4.16	6J1	306	354		0.6%		202	66%	0.4%		202	66%	0.2%		203	66%	0.2%		203	66%	0.1%		203	66%

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							2016				2017				2018				2019				2020			
Study Area	Substation	Voltage (kV)	Feeder	SN Rating (Amps)	SE Rating (Amps)	Comments	Growth Rate	Spot Loads	Amps	%SN	Growth Rate	Spot Loads	Amps	%SN	Growth Rate	Spot Loads	Amps	%SN	Growth Rate	Spot Loads	Amps	%SN	Growth Rate	Spot Loads	Amps	%SN
Providence	OLNEYVILLE 6	4.16	6J2	306	354		0.6%		235	77%	0.4%		235	77%	0.2%		236	77%	0.2%		236	77%	0.1%		237	77%
Providence	OLNEYVILLE 6	4.16	6J3	306	354		0.6%		126	41%	0.4%		126	41%	0.2%		127	41%	0.2%		127	41%	0.1%		127	42%
Providence	OLNEYVILLE 6	4.16	6J5	306	354		0.6%		116	38%	0.4%		116	38%	0.2%		117	38%	0.2%		117	38%	0.1%		117	38%
Providence	OLNEYVILLE 6	4.16	6J6	306	354		0.6%		148	48%	0.4%		149	49%	0.2%		149	49%	0.2%		149	49%	0.1%		149	49%
Providence	OLNEYVILLE 6	4.16	6J7	306	354		0.6%		227	74%	0.4%		228	75%	0.2%		229	75%	0.2%		229	75%	0.1%		229	75%
Providence	OLNEYVILLE 6	4.16	6J8	306	354		0.6%		70	23%	0.4%		70	23%	0.2%		70	23%	0.2%		70	23%	0.1%		70	23%
Providence	POINT STREET 76	12.47	76F1	484	490		0.6%		449	93%	0.4%		451	93%	0.2%		451	93%	0.2%		452	93%	0.1%		453	94%
Providence	POINT STREET 76	12.47	76F2	500	612		0.6%		451	90%	0.4%		453	91%	0.2%		454	91%	0.2%		455	91%	0.1%		455	91%
Providence	POINT STREET 76	12.47	76F3	546	653		0.6%		248	46%	0.4%		249	46%	0.2%		250	46%	0.2%		250	46%	0.1%		251	46%
Providence	POINT STREET 76	12.47	76F4	530	612		0.6%		530	100%	0.4%		532	100%	0.2%		533	101%	0.2%		534	101%	0.1%		535	101%
Providence	POINT STREET 76	12.47	76F5	448	570		0.6%		445	99%	0.4%		447	100%	0.2%		447	100%	0.2%		448	100%	0.1%		449	100%
Providence	POINT STREET 76	12.47	76F6	518	612		0.6%		512	99%	0.4%		514	99%	0.2%		515	99%	0.2%		516	100%	0.1%		516	100%
Providence	POINT STREET 76	12.47	76F7	525	612		0.6%		489	93%	0.4%		491	94%	0.2%		492	94%	0.2%		493	94%	0.1%		494	94%
Providence	POINT STREET 76	12.47	76F8	530	612		0.6%		255	48%	0.4%		256	48%	0.2%		257	48%	0.2%		257	49%	0.1%		258	49%
Providence	ROCHAMBEAU AVENUE 37	4.16	37J1	329	408		0.6%	25	257	78%	0.4%		258	79%	0.2%		259	79%	0.2%		259	79%	0.1%		260	79%
Providence	ROCHAMBEAU AVENUE 37	4.16	37J2	291	349		0.6%		265	91%	0.4%		266	91%	0.2%		266	91%	0.2%		267	92%	0.1%		267	92%
Providence	ROCHAMBEAU AVENUE 37	4.16	37J3	303	408		0.6%		263	87%	0.4%		264	87%	0.2%		264	87%	0.2%		265	87%	0.1%		265	88%
Providence	ROCHAMBEAU AVENUE 37	4.16	37J4	278	371		0.6%	-25	254	91%	0.4%		255	92%	0.2%		256	92%	0.2%		256	92%	0.1%		257	92%
Providence	ROCHAMBEAU AVENUE 37	4.16	37J5	347	408		0.6%		249	72%	0.4%		250	72%	0.2%		250	72%	0.2%		251	72%	0.1%		251	72%
Providence	SOUTH STREET 1	11.5	1101	250	250		0.6%		235		0.4%		235		0.2%		236		0.2%		236		0.1%		237	
Providence	SOUTH STREET 1	11.5	1151	322	375		0.6%		246	77%	0.4%		247	77%	0.2%		248	77%	0.2%		248	77%	0.1%		249	77%
Providence	SPRAGUE STREET 36	4.16	36J1	236	283		0.6%		193	82%	0.4%		194	82%	0.2%		194	82%	0.2%		195	82%	0.1%		195	83%
Providence	SPRAGUE STREET 36	4.16	36J2	252	299		0.6%		191	76%	0.4%		192	76%	0.2%		192	76%	0.2%		193	77%	0.1%		193	77%
Providence	SPRAGUE STREET 36	4.16	36J4	344	405		0.6%		254	74%	0.4%		255	74%	0.2%		255	74%	0.2%		256	74%	0.1%		256	74%
Providence	SPRAGUE STREET 36	4.16	36J5	315	315		0.6%		189	60%	0.4%		190	60%	0.2%		191	61%	0.2%		191	61%	0.1%		191	61%
South County East	BONNET 42	12.47	42F1	525	566		2.5%		522	100%	2.2%		534	102%	2.0%		545	104%	1.9%		555	106%	1.9%		566	108%
South County East	LAFAYETTE 30	12.47	30F1	350	385		2.5%		276	79%	2.2%		282	81%	2.0%		288	82%	1.9%		293	84%	1.9%		299	85%
South County East	LAFAYETTE 30	12.47	30F2	546	578		2.5%		476	87%	2.2%		486	89%	2.0%		496	91%	1.9%		506	93%	1.9%		515	94%
South County East	OLD BAPTIST ROAD 46	12.47	46F1	530	612		2.5%		483	91%	2.2%		494	93%	2.0%		504	95%	1.9%		514	97%	1.9%		523	99%
South County East	OLD BAPTIST ROAD 46	12.47	46F2	530	612		2.5%		486	92%	2.2%		497	94%	2.0%		507	96%	1.9%		516	97%	1.9%		526	99%
South County East	OLD BAPTIST ROAD 46	12.47	46F3	565	612		2.5%		513	91%	2.2%		524	93%	2.0%		534	95%	1.9%		545	96%	1.9%		555	98%
South County East	OLD BAPTIST ROAD 46	12.47	46F4	594	612		2.5%		531	89%	2.2%		543	91%	2.0%		554	93%	1.9%		564	95%	1.9%		575	97%
South County East	PEACEDALE 59	12.47	59F1	409	476		2.5%		177	43%	2.2%		181	44%	2.0%		185	45%	1.9%		188	46%	1.9%		192	47%
South County East	PEACEDALE 59	12.47	59F2	515	515		2.5%		355	69%	2.2%		363	70%	2.0%		370	72%	1.9%		377	73%	1.9%		385	75%
South County East	PEACEDALE 59	12.47	59F3	521	578		2.5%		497	95%	2.2%		508	97%	2.0%		518	99%	1.9%		528	101%	1.9%		538	103%
South County East	PEACEDALE 59	12.47	59F4	409	489		2.5%		188	46%	2.2%		192	47%	2.0%		196	48%	1.9%		200	49%	1.9%		203	50%
South County East	QUONSET 83	12.47	83F1	560	645		2.5%		151	27%	2.2%		155	28%	2.0%		158	28%	1.9%		161	29%	1.9%		164	29%
South County East	QUONSET 83	12.47	83F2	530	650		2.5%		451	85%	2.2%		461	87%	2.0%		470	89%	1.9%		479	90%	1.9%		488	92%
South County East	QUONSET 83	12.47	83F3	560	645		2.5%		231	41%	2.2%		236	42%	2.0%		241	43%	1.9%		245	44%	1.9%		250	45%
South County East	TOWER HILL 88	12.47	88F1	530	650		2.5%		438	83%	2.2%		448	85%	2.0%		457	86%	1.9%		466	88%	1.9%		474	90%
South County East	TOWER HILL 88	12.47	88F3	548	645		2.5%		532	97%	2.2%		544	99%	2.0%		555	101%	1.9%		565	103%	1.9%		576	105%
South County East	TOWER HILL 88	12.47	88F5	530	650		2.5%		409	77%	2.2%		418	79%	2.0%		427	80%	1.9%		435	82%	1.9%		443	84%
South County East	TOWER HILL 88	12.47	88F7	530	650	Expected in-service 2014	2.5%		428	81%	2.2%		437	83%	2.0%		446	84%	1.9%		455	86%	1.9%		463	87%
South County East	WAKEFIELD 17	12.47	17F1	602	645	Feeder Upgrade in 2014	2.5%		563	93%	2.2%		575	96%	2.0%		587	97%	1.9%		598	99%	1.9%		609	101%
South County East	WAKEFIELD 17	12.47	17F2	510	510		2.5%		436	85%	2.2%		445	87%	2.0%		454	89%	1.9%		463	91%	1.9%		472	92%
South County East	WAKEFIELD 17	12.47	17F3	597	626		2.5%		521	87%	2.2%		533	89%	2.0%		543	91%	1.9%		554	93%	1.9%		564	95%
South County West	ASHAWAY 43	12.47	43F1	388	423	Planned retire 2014 (Hopkinton related)																				
South County West	HOPE VALLEY 41	12.47	41F1	347	430	Planned retire 2014 (Hopkinton related)																				
South County West	HOPKINTON	12.47	F1	515	515	Expected in-service 2014	2.5%		328	64%	2.2%		335	65%	2.0%		342	66%	1.9%		348	68%	1.9%		355	69%
South County West	HOPKINTON	12.47	F2	645	645	Expected in-service 2014	2.5%		359	56%	2.2%		367	57%	2.0%		375	58%	1.9%		382	59%	1.9%		389	60%
South County West	HOPKINTON	12.47	F3	530	650	Expected in-service 2014	2.5%		465	88%	2.2%		475	90%	2.0%		485	91%	1.9%		494	93%	1.9%		503	95%
South County West	HOPKINTON	12.47	F4	645	645	Expected in-service 2014	2.5%		507	79%	2.2%		518	80%	2.0%		529	82%	1.9%		539	84%	1.9%		549	85%
South County West	HOPKINTON	12.47	F5	530	650	Expected in-service 2014	2.5%		433	82%	2.2%		443	84%	2.0%		452	85%	1.9%		460	87%	1.9%		469	88%
South County West	HOPKINTON	12.47	F6	645	645	Expected in-service 2014	2.5%		454	70%	2.2%		464	72%	2.0%		474	73%	1.9%		483	75%	1.9%		492	76%
South County West	HOPKINTON	13.47	F7	315	315	Expected in-service 2014	2.5%		296	94%	2.2%		302	96%	2.0%		308	98%	1.9%		314	100%	1.9%		320	102%
South County West	KENYON 68	12.47	68F1	512	612		2.5%		413	81%	2.2%		422	82%	2.0%		430	84%	1.9%		438	86%	1.9%		447	87%
South County West	KENYON 68	12.47	68F2	511	612		2.5%		507	99%	2.2%		518	101%	2.0%		528	103%	1.9%		538	105%	1.9%		548	107%
South County West	KENYON 68	12.47	68F3	512	515		2.5%		467	91%	2.2%		478	93%	2.0%		487	95%	1.9%		496	97%	1.9%		506	99%
South County West	KENYON 68	12.47	68F4	514	612		2.5%		388	76%	2.2%		397	77%	2.0%		405	79%	1.9%		412	80%	1.9%		420	82%
South County West	KENYON 68	12.47	68F5	612	612		2.5%		344	56%	2.2%		352	57%	2.0%		359	59%	1.9%		366	60%	1.9%		373	61%
South County West	LANGWORTHY 86	12.47	86F1	640	648	Limiting element upgraded (transformer) 2014	2.5%		487	76%	2.2%		497	78%	2.0%		507	79%	1.9%		517	81%	1.9%		527	82%
South County West	WESTERLY 16	12.47	16F1	515	515	Planned retire 2014 (Hopkinton related)																				
South County West	WESTERLY 16	12.47	16F2	515	515	Planned retire 2014 (Hopkinton related)																				
South County West	WESTERLY 16	12.47	16F3	515	515	Planned retire 2014 (Hopkinton related)																				
South County West	WESTERLY 16	12.47	16F4	645	645	Planned retire 2014 (Hopkinton related)																				
Tiverton	TIVERTON	12.47	33F1	478	515		0.6%		326	68%	0.4%		328	69%	0.2%		328	69%	0.2%		329	69%	0.1%		329	69%
Tiverton	TIVERTON	12.47	33F2	456	515		0.6%		361	79%	0.4%		363	80%	0.2%		363	80%	0.2%		364	80%	0.1%		364	80%
Tiverton	TIVERTON	12.47	33F3	478	600		0.6%		428	89%	0.4%		429	90%	0.2%		430	90%	0.2%		431	90%	0.1%		431	90%
Tiverton	TIVERTON	12.47	33F4	456	576		0.6%		471	103%	0.4%		473	104%	0.2%		474	104%	0.2%		475	104%	0.1%		475	104%

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							2021				2022				2023				2024				2025			
Study Area	Substation	Voltage (kV)	Feeder	SN Rating (Amps)	SE Rating (Amps)	Comments	Growth Rate	Spot Loads	Amps	%SN	Growth Rate	Spot Loads	Amps	%SN	Growth Rate	Spot Loads	Amps	%SN	Growth Rate	Spot Loads	Amps	%SN	Growth Rate	Spot Loads	Amps	%SN
Blackstone Valley North	FARNUM	23	105K1	515	515		0.1%		102	20%	0.1%		102	20%	0.1%		102	20%	0.1%		102	20%	0.1%		102	20%
Blackstone Valley North	HIGHLAND DRIVE	13.8	F1	585	585	Estimated in-service 2014	0.1%		313	53%	0.1%		313	53%	0.1%		313	54%	0.1%		314	54%	0.1%		314	54%
Blackstone Valley North	HIGHLAND DRIVE	13.8	F2	585	585	Estimated in-service 2014	0.1%		266	45%	0.1%		266	46%	0.1%		266	46%	0.1%		267	46%	0.1%		267	46%
Blackstone Valley North	HIGHLAND DRIVE	13.8	F3	585	585	Estimated in-service 2014	0.1%		293	50%	0.1%		294	50%	0.1%		294	50%	0.1%		294	50%	0.1%		295	50%
Blackstone Valley North	HIGHLAND DRIVE	13.8	F4	585	585	Estimated in-service 2014	0.1%		32	6%	0.1%		33	6%	0.1%		33	6%	0.1%		33	6%	0.1%		33	6%
Blackstone Valley North	HIGHLAND DRIVE	13.8	F5	515	515	Estimated in-service 2014	0.1%		400	78%	0.1%		400	78%	0.1%		401	78%	0.1%		401	78%	0.1%		402	78%
Blackstone Valley North	HIGHLAND DRIVE	13.8	F6	585	585	Estimated in-service 2014	0.1%		444	76%	0.1%		444	76%	0.1%		444	76%	0.1%		445	76%	0.1%		445	76%
Blackstone Valley North	NASONVILLE	13.8	127W43	585	585		0.1%		322	55%	0.1%		322	55%	0.1%		322	55%	0.1%		323	55%	0.1%		323	55%
Blackstone Valley North	NASONVILLE	13.8	127W40	461	515		0.1%		378	82%	0.1%		379	82%	0.1%		379	82%	0.1%		379	82%	0.1%		380	82%
Blackstone Valley North	NASONVILLE	13.8	127W41	432	515		0.1%		274	64%	0.1%		275	64%	0.1%		275	64%	0.1%		275	64%	0.1%		275	64%
Blackstone Valley North	NASONVILLE	13.8	127W42	458	515		0.1%		322	70%	0.1%		322	70%	0.1%		322	70%	0.1%		323	70%	0.1%		323	71%
Blackstone Valley North	RIVERSIDE 8	13.8	108W51	499	631		0.1%		432	87%	0.1%		432	87%	0.1%		433	87%	0.1%		433	87%	0.1%		434	87%
Blackstone Valley North	RIVERSIDE 8	13.8	108W53	499	631		0.1%		439	88%	0.1%		440	88%	0.1%		440	88%	0.1%		441	88%	0.1%		441	88%
Blackstone Valley North	RIVERSIDE 8	13.8	108W55	474	474		0.1%		35	7%	0.1%		35	7%	0.1%		35	7%	0.1%		35	7%	0.1%		35	7%
Blackstone Valley North	RIVERSIDE 8	13.8	108W60	515	515		0.1%		318	62%	0.1%		319	62%	0.1%		319	62%	0.1%		319	62%	0.1%		320	62%
Blackstone Valley North	RIVERSIDE 8	13.8	108W61	500	500		0.1%		126	25%	0.1%		126	25%	0.1%		126	25%	0.1%		126	25%	0.1%		127	25%
Blackstone Valley North	RIVERSIDE 8	13.8	108W62	515	515		0.1%		272	53%	0.1%		272	53%	0.1%		273	53%	0.1%		273	53%	0.1%		273	53%
Blackstone Valley North	RIVERSIDE 8	13.8	108W63	515	515		0.1%		101	20%	0.1%		101	20%	0.1%		101	20%	0.1%		102	20%	0.1%		102	20%
Blackstone Valley North	RIVERSIDE 8	13.8	108W65	515	515		0.1%		345	67%	0.1%		346	67%	0.1%		346	67%	0.1%		346	67%	0.1%		347	67%
Blackstone Valley North	STAPLES 112	13.8	112W41	515	515		0.1%		128	39%	0.1%		128	39%	0.1%		128	39%	0.1%		128	39%	0.1%		128	39%
Blackstone Valley North	STAPLES 112	13.8	112W42	500	599		0.1%		458	92%	0.1%		458	92%	0.1%		459	92%	0.1%		459	92%	0.1%		460	92%
Blackstone Valley North	STAPLES 112	13.8	112W43	515	515		0.1%		169	46%	0.1%		169	46%	0.1%		169	46%	0.1%		169	46%	0.1%		169	46%
Blackstone Valley North	STAPLES 112	13.8	112W44	406	484		0.1%		404	100%	0.1%		404	100%	0.1%		405	100%	0.1%		405	100%	0.1%		406	100%
Blackstone Valley North	WOONSOCKET	13.8	26W41	515	515	In-Service 2012	0.1%		317	62%	0.1%		317	62%	0.1%		318	62%	0.1%		318	62%	0.1%		318	62%
Blackstone Valley North	WOONSOCKET	13.8	26W42	515	515	In-Service 2012	0.1%		296	57%	0.1%		296	57%	0.1%		296	58%	0.1%		296	58%	0.1%		297	58%
Blackstone Valley North	WOONSOCKET	13.8	26W43	515	515	In-Service 2012	0.1%		476	93%	0.1%		477	93%	0.1%		477	93%	0.1%		478	93%	0.1%		478	93%
Blackstone Valley South	CENTRAL FALLS SUB	4.16	104J1	350	350		0.1%		80	23%	0.1%		80	23%	0.1%		81	23%	0.1%		81	23%	0.1%		81	23%
Blackstone Valley South	CENTRAL FALLS SUB	4.16	104J3	350	350		0.1%		124	35%	0.1%		124	35%	0.1%		124	35%	0.1%		124	36%	0.1%		124	36%
Blackstone Valley South	CENTRAL FALLS SUB	4.16	104J5	350	350		0.1%		171	49%	0.1%		172	49%	0.1%		172	49%	0.1%		172	49%	0.1%		172	49%
Blackstone Valley South	CENTRAL FALLS SUB	4.16	104J7	350	350		0.1%		166	48%	0.1%		167	48%	0.1%		167	48%	0.1%		167	48%	0.1%		167	48%
Blackstone Valley South	CENTRE ST	4.16	106J1	350	350		0.1%		116	33%	0.1%		116	33%	0.1%		116	33%	0.1%		116	33%	0.1%		116	33%
Blackstone Valley South	CENTRE ST	4.16	106J3	350	350		0.1%		162	46%	0.1%		162	46%	0.1%		162	46%	0.1%		162	46%	0.1%		162	46%
Blackstone Valley South	CENTRE ST	4.16	106J7	350	350		0.1%		64	18%	0.1%		64	18%	0.1%		64	18%	0.1%		64	18%	0.1%		65	18%
Blackstone Valley South	COTTAGE STREET SUB	4.16	109J1	408	408		0.1%		335	82%	0.1%		335	82%	0.1%		336	82%	0.1%		336	82%	0.1%		336	82%
Blackstone Valley South	COTTAGE STREET SUB	4.16	109J3	408	408		0.1%		254	62%	0.1%		255	62%	0.1%		255	62%	0.1%		255	63%	0.1%		255	63%
Blackstone Valley South	COTTAGE STREET SUB	4.16	109J5	408	408		0.1%		301	74%	0.1%		301	74%	0.1%		302	74%	0.1%		302	74%	0.1%		302	74%
Blackstone Valley South	CROSSMAN STREET SUB	4.16	111J1	350	350		0.1%		268	77%	0.1%		268	77%	0.1%		268	77%	0.1%		269	77%	0.1%		269	77%
Blackstone Valley South	CROSSMAN STREET SUB	4.16	111J3	350	350		0.1%		181	52%	0.1%		181	52%	0.1%		181	52%	0.1%		181	52%	0.1%		181	52%
Blackstone Valley South	DAGGETT SUB	4.16	113J1	390	390		0.1%		170	44%	0.1%		171	44%	0.1%		171	44%	0.1%		171	44%	0.1%		171	44%
Blackstone Valley South	DAGGETT SUB	4.16	113J2	390	390		0.1%		133	34%	0.1%		133	34%	0.1%		133	34%	0.1%		133	34%	0.1%		133	34%
Blackstone Valley South	FRONT ST. SUB	4.16	24J1	350	350		0.1%		161	46%	0.1%		161	46%	0.1%		161	46%	0.1%		161	46%	0.1%		161	46%
Blackstone Valley South	HYDE SUB	4.16	28J1	400	400		0.1%		118	29%	0.1%		118	30%	0.1%		118	30%	0.1%		118	30%	0.1%		118	30%
Blackstone Valley South	HYDE SUB	4.16	28J2	400	400		0.1%		165	41%	0.1%		165	41%	0.1%		165	41%	0.1%		166	41%	0.1%		166	41%
Blackstone Valley South	LEE STREET SUB	4.16	30J1	380	380		0.1%		214	56%	0.1%		215	56%	0.1%		215	57%	0.1%		215	57%	0.1%		215	57%
Blackstone Valley South	LEE STREET SUB	4.16	30J3	380	380		0.1%		343	90%	0.1%		343	90%	0.1%		344	90%	0.1%		344	91%	0.1%		344	91%
Blackstone Valley South	LEE STREET SUB	4.16	30J5	310	310		0.1%		134	43%	0.1%		134	43%	0.1%		134	43%	0.1%		134	43%	0.1%		134	43%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W1	350	350		0.1%		68	19%	0.1%		68	19%	0.1%		68	19%	0.1%		68	19%	0.1%		68	19%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W2	350	350		0.1%		45	13%	0.1%		45	13%	0.1%		45	13%	0.1%		45	13%	0.1%		45	13%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W3	350	350		0.1%		49	14%	0.1%		49	14%	0.1%		49	14%	0.1%		49	14%	0.1%		49	14%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W43	365	365		0.1%		246	68%	0.1%		247	68%	0.1%		247	68%	0.1%		247	68%	0.1%		247	68%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W49	202	250		0.1%		156	77%	0.1%		157	78%	0.1%		157	78%	0.1%		157	78%	0.1%		157	78%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W50	356	365		0.1%		254	71%	0.1%		254	71%	0.1%		254	71%	0.1%		255	72%	0.1%		255	72%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W51	365	365		0.1%		170	47%	0.1%		171	47%	0.1%		171	47%	0.1%		171	47%	0.1%		171	47%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W53	407	540		0.1%		226	56%	0.1%		226	56%	0.1%		227	56%	0.1%		227	56%	0.1%		227	56%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W60	334	449		0.1%		320	96%	0.1%		321	96%	0.1%		321	96%	0.1%		321	96%	0.1%		322	96%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W61	343	411		0.1%		330	96%	0.1%		330	96%	0.1%		331	96%	0.1%		331	97%	0.1%		331	97%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W62	480	480		0.1%		461	96%	0.1%		461	96%	0.1%		462	96%	0.1%		462	96%	0.1%		463	96%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W63	515	515		0.1%		417	81%	0.1%		417	81%	0.1%		418	81%	0.1%		418	81%	0.1%		419	81%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W65	345	360		0.1%		335	97%	0.1%		336	97%	0.1%		336	97%	0.1%		336	98%	0.1%		337	98%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W66	360	360		0.1%		156	43%	0.1%		157	44%	0.1%		157	44%	0.1%		157	44%	0.1%		157	44%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W80	285	365		0.1%		158	55%	0.1%		158	55%	0.1%		158	55%	0.1%		158	55%	0.1%		158	55%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W81	368	540		0.1%		342	93%	0.1%		342	93%	0.1%		342	93%	0.1%		343	93%	0.1%		343	93%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W83	346	540		0.1%		297	86%	0.1%		297	86%	0.1%		297	86%	0.1%		298	86%	0.1%		298	86%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W84	332	365		0.1%		206	62%	0.1%		206	62%	0.1%		206	62%	0.1%		207	62%	0.1%		207	62%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W85	305	365		0.1%		259	85%	0.1%		260	85%	0.1%		260	85%	0.1%		260	85%	0.1%		260	85%
Blackstone Valley South	PAWTUCKET #2 STATION	4.16	148J1	370	370		0.1%		170	46%	0.1%		170	46%	0.1%		170	46%	0.1%		171	46%	0.1%		171	46%
Blackstone Valley South	PAWTUCKET #2 STATION	4.16	148J3	290	290		0.1%		117	40%	0.1%		117	40%	0.1%		117	40%	0.1%		118	41%	0.1%		118	41%
Blackstone Valley South	PAWTUCKET #2 STATION	4.16	148J5	370	370		0.1%		214	58%	0.1%		215	58%	0.1%		215	58%	0.1%		215	58%	0.1%		215	58%
Blackstone Valley South	PAWTUCKET #2 STATION	4.16	148J7	370	370		0.1%		226	61%	0.1%		226	61%	0.1%		227	61%	0.1%		227	61%	0.1%		227	61%
Blackstone Valley South	SOUTHEAST SUB	4.16	60J1	408	408		0.1%		91	22%	0.1%		92	22%	0.1%		92	22%	0.1%		92	22%	0.1%		92	23%
Blackstone Valley South	SOUTHEAST SUB	4.16	60J3	408	408		0.1%		123	30%	0.1%		123	30%	0.1%		123	30%	0.1%		123	30%	0.1%		123	30%
Blackstone Valley South	SOUTHEAST SUB	4.16	60J5	350	350		0.1%		117	33%	0.1%		117	34%	0.1%		117	34%	0.1%		118	34%	0.1%		118	34%
Blackstone Valley South	VALLEY SUB	13.8	102W41	493	515		0.1%		260	53%	0.1%		261	53%	0.1%		261	53%	0.1%		261	53%	0.1%		261	53%
Blackstone Valley South	VALLEY SUB	13.8	102W42	463	515		0.1%		424	92%	0.1%		425	92%	0.1%		425	92%	0.1%		426	92%	0.1%		426	92%
Blackstone Valley South	VALLEY SUB	13.8	102W44	328	460		0.1%		299	91%	0.1%		299	91%	0.1%		300	91%	0.1%		300	91%	0.1%		300	92%
Blackstone Valley South	VALLEY SUB	13.8	102W50	364	375		0.1%		151	42%	0.1%		151	42%	0.1%		151	42%	0.1%		152	42%	0.1%		152	42%
Blackstone Valley South	VALLEY SUB	13.8	102W51	341	497		0.1%		315	92%	0.1%		315	92%	0.1%		316	93%	0.1%		316	93%	0.1%		316	93%
Blackstone Valley South	VALLEY SUB	13.8	102W52	300	365		0.1%		108	36%	0.1%		108	36%	0.1%		108	36%	0.1%		109	36%	0.1%		109	36%
Blackstone Valley South	VALLEY SUB	13.8	102W54	292	413		0.1%		265	91%	0.1%		265	91%	0.1%		265	91%	0.1%		265	91%	0.1%		266	91%
Blackstone Valley South	WASHINGTON SUB	13.8	126W40	515	645		0.1%		266	52%	0.1%		266	52%	0.1%		266	52%	0.1%		267	52%	0.1%		267	52%
Blackstone Valley South	WASHINGTON SUB	13.8	126W41	520	535		0.1%		455	88%	0.1%		456	88%	0.1%		456	88%	0.1%		457	88%	0.1%		457	88%
Blackstone Valley South	WASHINGTON SUB	13.8	126W42	525	600		0.1%		371	71%	0.1%		371	71%	0.1%		372	71%	0.1%		372	71%	0.1%		372	71%
Blackstone Valley South	WASHINGTON SUB	13.8	126W50	528	645		0.1%		456	86%	0.1%		457	86%	0.1%		457	87%	0.1%		458	87%	0.1%		458	87%

Feeders - Normal Configuration Summary
2012 Annual Planning
Rhode Island Study Areas

Study Area	Substation	Voltage (kV)	Feeder	SN Rating (Amps)	SE Rating (Amps)	Comments	2021 Growth Rate	2021 Spot Loads	2021 Amps	2021 %SN	2022 Growth Rate	2022 Spot Loads	2022 Amps	2022 %SN	2023 Growth Rate	2023 Spot Loads	2023 Amps	2023 %SN	2024 Growth Rate	2024 Spot Loads	2024 Amps	2024 %SN	2025 Growth Rate	2025 Spot Loads	2025 Amps	2025 %SN
Blackstone Valley South	WASHINGTON SUB	13.8	126W51	515	515		0.1%		488	95%	0.1%		488	95%	0.1%		489	95%	0.1%		489	95%	0.1%		490	95%
Blackstone Valley South	WASHINGTON SUB	13.8	126W53	583	750		0.1%		24	4%	0.1%		24	4%	0.1%		24	4%	0.1%		24	4%	0.1%		24	4%
Blackstone Valley South	WASHINGTON SUB	13.8	126W54	530	645		0.1%		503	95%	0.1%		503	95%	0.1%		504	95%	0.1%		504	95%	0.1%		505	95%
Central RI East	APPONAUG 3	12.47	3F1	510	510		1.9%		491	96%	1.8%		500	98%	1.8%		509	100%	1.8%		518	102%	1.7%		527	103%
Central RI East	APPONAUG 3	12.47	3F2	515	515		1.9%		474	92%	1.8%		483	94%	1.8%		491	95%	1.8%		500	97%	1.7%		509	99%
Central RI East	DRUMROCK 14	12.47	14F1	530	612		1.9%		501	95%	1.8%		510	96%	1.8%		519	98%	1.8%		528	100%	1.7%		537	101%
Central RI East	DRUMROCK 14	12.47	14F2	530	595		1.9%		450	85%	1.8%		458	86%	1.8%		466	88%	1.8%		474	89%	1.7%		482	91%
Central RI East	DRUMROCK 14	12.47	14F3	515	515		1.9%		369	72%	1.8%		376	73%	1.8%		382	74%	1.8%		389	76%	1.7%		396	77%
Central RI East	DRUMROCK 14	12.47	14F4	515	515		1.9%		415	81%	1.8%		422	82%	1.8%		430	83%	1.8%		438	85%	1.7%		445	86%
Central RI East	KILVERT STREET 87	12.47	87F1	530	645		1.9%		506	95%	1.8%		515	97%	1.8%		524	99%	1.8%		534	101%	1.7%		543	102%
Central RI East	KILVERT STREET 87	12.47	87F2	570	662		1.9%		328	58%	1.8%		334	59%	1.8%		340	60%	1.8%		346	61%	1.7%		352	62%
Central RI East	KILVERT STREET 87	12.47	87F3	530	645		1.9%		388	73%	1.8%		395	75%	1.8%		402	76%	1.8%		409	77%	1.7%		416	78%
Central RI East	KILVERT STREET 87	12.47	87F4	530	650		1.9%		402	76%	1.8%		409	77%	1.8%		417	79%	1.8%		424	80%	1.7%		431	81%
Central RI East	KILVERT STREET 87	12.47	87F5	530	650	Expected In-Service 2015	1.9%		452	85%	1.8%		460	87%	1.8%		469	88%	1.8%		477	90%	1.7%		485	92%
Central RI East	KILVERT STREET 87	12.47	87F6	530	650	Expected In-Service 2015	1.9%		283	53%	1.8%		288	54%	1.8%		293	55%	1.8%		298	56%	1.7%		303	57%
Central RI East	LINCOLN AVENUE 72	12.47	72F1	530	650		1.9%		376	71%	1.8%		383	72%	1.8%		390	74%	1.8%		397	75%	1.7%		404	76%
Central RI East	LINCOLN AVENUE 72	12.47	72F2	530	650		1.9%		487	92%	1.8%		495	93%	1.8%		504	95%	1.8%		513	97%	1.7%		522	98%
Central RI East	LINCOLN AVENUE 72	12.47	72F3	530	650		1.9%		445	84%	1.8%		453	85%	1.8%		461	87%	1.8%		470	89%	1.7%		478	90%
Central RI East	LINCOLN AVENUE 72	12.47	72F4	530	650		1.9%		522	98%	1.8%		531	100%	1.8%		541	102%	1.8%		551	104%	1.7%		560	106%
Central RI East	LINCOLN AVENUE 72	12.47	72F5	515	515		1.9%		504	98%	1.8%		513	100%	1.8%		522	101%	1.8%		531	103%	1.7%		540	105%
Central RI East	LINCOLN AVENUE 72	12.47	72F6	645	645		1.9%		439	68%	1.8%		447	69%	1.8%		455	71%	1.8%		463	72%	1.7%		471	73%
Central RI East	PONTIAC 27	12.47	27F1	555	555	Limiting cable element upgraded 2016	1.9%		556	100%	1.8%		566	102%	1.8%		576	104%	1.8%		587	106%	1.7%		597	108%
Central RI East	PONTIAC 27	12.47	27F2	515	515	Limiting cable element upgraded 2016	1.9%		365	71%	1.8%		371	72%	1.8%		378	73%	1.8%		385	75%	1.7%		392	76%
Central RI East	PONTIAC 27	12.47	27F3	460	515		1.9%		241	52%	1.8%		245	53%	1.8%		250	54%	1.8%		254	55%	1.7%		259	56%
Central RI East	PONTIAC 27	12.47	27F4	460	515		1.9%		514	112%	1.8%		524	114%	1.8%		533	116%	1.8%		543	118%	1.7%		552	120%
Central RI East	PONTIAC 27	12.47	27F5	530	650	Limiting cable element upgraded 2016	1.9%		475	90%	1.8%		484	91%	1.8%		493	93%	1.8%		501	95%	1.7%		510	96%
Central RI East	PONTIAC 27	12.47	27F6	530	650	Limiting cable element upgraded 2016	1.9%		705	133%	1.8%		717	135%	1.8%		730	138%	1.8%		743	140%	1.7%		756	143%
Central RI East	WARWICK 52	12.47	52F1	409	476		1.9%		270	66%	1.8%		275	67%	1.8%		280	68%	1.8%		285	70%	1.7%		290	71%
Central RI East	WARWICK 52	12.47	52F2	476	476		1.9%		275	58%	1.8%		280	59%	1.8%		285	60%	1.8%		290	61%	1.7%		295	62%
Central RI East	WARWICK 52	12.47	52F3	526	560	Feeder Upgrade in 2014	1.9%		531	101%	1.8%		541	103%	1.8%		551	105%	1.8%		561	107%	1.7%		570	108%
Central RI West	ANTHONY	12.47	64F1	361	374		1.9%		289	80%	1.8%		294	81%	1.8%		299	83%	1.8%		305	84%	1.7%		310	86%
Central RI West	ANTHONY	12.47	64F2	361	374		1.9%		266	74%	1.8%		271	75%	1.8%		276	76%	1.8%		280	78%	1.7%		285	79%
Central RI West	ARCTIC	4.16	49J1	295	352		1.9%		281	95%	1.8%		286	97%	1.8%		292	99%	1.8%		297	101%	1.7%		302	102%
Central RI West	ARCTIC	4.16	49J2	295	352		1.9%		69	23%	1.8%		70	24%	1.8%		71	24%	1.8%		73	25%	1.7%		74	25%
Central RI West	ARCTIC	4.16	49J3	295	315		1.9%		277	94%	1.8%		282	96%	1.8%		287	97%	1.8%		293	99%	1.7%		298	101%
Central RI West	ARCTIC	4.16	49J4	295	352	Planned retire 2015 - New London Ave Related																					
Central RI West	COVENTRY	12.47	54F1	526	560		1.9%		409	78%	1.8%		417	79%	1.8%		424	81%	1.8%		432	82%	1.7%		439	83%
Central RI West	DIVISION ST	12.47	61F1	450	476		1.9%		465	103%	1.8%		473	105%	1.8%		481	107%	1.8%		490	109%	1.7%		498	111%
Central RI West	DIVISION ST	12.47	61F2	450	476		1.9%		454	101%	1.8%		462	103%	1.8%		470	104%	1.8%		479	106%	1.7%		487	108%
Central RI West	DIVISION ST	12.47	61F3	450	476		1.9%		423	94%	1.8%		430	96%	1.8%		438	97%	1.8%		446	99%	1.7%		454	101%
Central RI West	DIVISION ST	12.47	61F4	450	645		1.9%		469	104%	1.8%		477	106%	1.8%		486	108%	1.8%		494	110%	1.7%		503	112%
Central RI West	HOPE	12.47	15F1	348	394		1.9%		306	88%	1.8%		312	90%	1.8%		317	91%	1.8%		323	93%	1.7%		328	94%
Central RI West	HOPE	12.47	15F2	476	476		1.9%		509	107%	1.8%		518	109%	1.8%		528	111%	1.8%		537	113%	1.7%		546	115%
Central RI West	HOPKINS HILL	12.47	63F1	538	650		1.9%		318	59%	1.8%		323	60%	1.8%		329	61%	1.8%		335	62%	1.7%		341	63%
Central RI West	HOPKINS HILL	12.47	63F2	530	650		1.9%		557	105%	1.8%		567	107%	1.8%		577	109%	1.8%		588	111%	1.7%		598	113%
Central RI West	HOPKINS HILL	12.47	63F3	530	650		1.9%		427	81%	1.8%		434	82%	1.8%		442	83%	1.8%		450	85%	1.7%		458	86%
Central RI West	HOPKINS HILL	12.47	63F4	530	650		1.9%		498	94%	1.8%		507	96%	1.8%		516	97%	1.8%		526	99%	1.7%		535	101%
Central RI West	HOPKINS HILL	12.47	63F5	530	650		1.9%		432	82%	1.8%		440	83%	1.8%		448	84%	1.8%		456	86%	1.7%		464	87%
Central RI West	HOPKINS HILL	12.47	63F6	530	650		1.9%		587	111%	1.8%		598	113%	1.8%		608	115%	1.8%		619	117%	1.7%		630	119%
Central RI West	HUNT RIVER	12.47	40F1	274	327	Planned retire 2017 - Flood Mitigation																					
Central RI West	KENT COUNTY	12.47	22F1	530	650		1.9%		555	105%	1.8%		565	107%	1.8%		575	108%	1.8%		585	110%	1.7%		595	112%
Central RI West	KENT COUNTY	12.47	22F2	530	650		1.9%		559	105%	1.8%		569	107%	1.8%		579	109%	1.8%		590	111%	1.7%		600	113%
Central RI West	KENT COUNTY	12.47	22F3	530	650		1.9%		388	73%	1.8%		395	75%	1.8%		402	76%	1.8%		410	77%	1.7%		416	79%
Central RI West	KENT COUNTY	12.47	22F4	586	662		1.9%		430	73%	1.8%		438	75%	1.8%		446	76%	1.8%		454	77%	1.7%		461	79%
Central RI West	KENT COUNTY	12.47	22F6	530	650	Expected In-Service 2017	1.9%		475	90%	1.8%		483	91%	1.8%		492	93%	1.8%		501	95%	1.7%		509	96%
Central RI West	NATICK	12.47	29F1	526	560		1.9%		445	85%	1.8%		453	86%	1.8%		461	88%	1.8%		469	89%	1.7%		477	91%
Central RI West	NATICK	12.47	29F2	408	408		1.9%		436	107%	1.8%		444	109%	1.8%		452	111%	1.8%		460	113%	1.7%		468	115%
Central RI West	TIOGUE AVE	12.47	100F1	570	612	In-Service 2013	1.9%		515	90%	1.8%		524	92%	1.8%		534	94%	1.8%		544	95%	1.7%		553	97%
Central RI West	WARWICK MALL	12.47	28F1	390	412		1.9%		215	55%	1.8%		219	56%	1.8%		223	57%	1.8%		227	58%	1.7%		231	59%
Central RI West	WARWICK MALL	12.47	28F2	390	422		1.9%		162	41%	1.8%		164	42%	1.8%		167	43%	1.8%		170	44%	1.7%		173	44%
Central RI West	NEW LONDON AVE	12.47	150F1	645	645	Expected In-Service 2015	1.9%		396	61%	1.8%		403	62%	1.8%		410	64%	1.8%		417	65%	1.7%		425	66%
Central RI West	NEW LONDON AVE	12.47	150F3	530	650	Expected In-Service 2015	1.9%		328	62%	1.8%		334	63%	1.8%		340	64%	1.8%		346	65%	1.7%		352	66%
Central RI West	NEW LONDON AVE	12.47	150F5	530	650	Expected In-Service 2015	1.9%		367	69%	1.8%		374	71%	1.8%		381	72%	1.8%		388	73%	1.7%		394	74%
Central RI West	NEW LONDON AVE	12.47	150F7	645	645	Expected In-Service 2015	1.9%		283	44%	1.8%		288	45%	1.8%		293	45%	1.8%		298	46%	1.7%		303	47%
East Bay	BARRINGTON 4	12.47	4F1	515	515		0.1%		492	95%	0.2%		493	96%	0.1%		493	96%	0.1%		494	96%	0.1%		494	96%
East Bay	BARRINGTON 4	12.47	4F2	510	510		0.1%		473	93%	0.2%		474	93%	0.1%		475	93%	0.1%		475	93%	0.1%		476	93%
East Bay	BRISTOL 51A	12.47	51F1	502	612		0.1%		473	94%	0.2%		474	94%	0.1%		474	94%	0.1%		475	95%	0.1%		475	95%
East Bay	BRISTOL 51A	12.47	51F2	530	612		0.1%		465	88%	0.2%		466	88%	0.1%		466	88%	0.1%		467	88%	0.1%		467	88%
East Bay	BRISTOL 51A	12.47	51F3	502	612		0.1%		444	88%	0.2%		445	89%	0.1%		445	89%	0.1%		446	89%	0.1%		446	89%
East Bay	KENT CORNERS 47	4.16	47J1	285	313		0.1%		38	13%	0.2%		38	13%	0.1%		38	13%	0.1%		38	13%	0.1%		38	13%
East Bay	KENT CORNERS 47	4.16	47J2	379	408		0.1%		325	86%	0.2%		326	86%	0.1%		326	86%	0.1%		326	86%	0.1%		327	86%
East Bay	KENT CORNERS 47	4.16	47J3	379	408	Upgrade limiting element (regualtors) 2013	0.1%		360	95%	0.2%		360	95%	0.1%		361	95%	0.1%		361	95%	0.1%		362	95%
East Bay	KENT CORNERS 47	4.16	47J4	379	408		0.1%		321	85%	0.2%		321	85%	0.1%		322	85%	0.1%		322	85%	0.1%		322	85%
East Bay	PHILLIPSDALE 20	12.47	20F1	425	450		0.1%		281	66%	0.2%		281	66%	0.1%		281	66%	0.1%		282	66%	0.1%		282	66%
East Bay	PHILLIPSDALE 20	12.47	20F2	425	450		0.1%		335	79%	0.2%		336	79%	0.1%		336	79%	0.1%		336	79%	0.1%		337	79%
East Bay	WAMPANOAG 48	12.47	48F1	502	507		0.1%		488	97%	0.2%		489	97%	0.1%		489	97%	0.1%		490	98%	0.1%		490	98%
East Bay	WAMPANOAG 48	12.47	48F2	515	515		0.1%		403	78%	0.2%		404	78%	0.1%		404	78%	0.1%		405	79%	0.1%		405	79%
East Bay	WAMPANOAG 48	12.47	48F3	510	515		0.1%		498	98%	0.2%		499	98%	0.1%		499	98%	0.1%		500	98%	0.1%		500	98%
East Bay	WAMPANOAG 48	12.47	48F4	530	612		0.1%		500	94%	0.2%		501	94%	0.1%		501	95%	0.1%		502	95%	0.1%		502	95%
East Bay	WAMPANOAG 48	12.47	48F5	485	490		0.1%		447	92%	0.2%		448	92%	0.1%		448	92%	0.1%		449	93%	0.1%		449	93%
East Bay	WAMPANOAG 48	12.47	48F6	530	612		0.1%		456	86%	0.2%		457	86%	0.1%		457	86%	0.1%		458	86%	0.1%		458	86%
East Bay	WARREN 5	12.47	5F1	425	520		0.1%		335	79%	0.2%		335	79%	0.1%		336	79%	0.1%		336	79%	0.1%		336	79%
East Bay	WARREN 5	12.47	5F2	434	434		0.1%		436	101%	0.2%		437	101%	0.1%		438	101%	0.1%		438	101%	0.1%		438	101%

Feeders - Normal Configuration Summary
2012 Annual Planning
Rhode Island Study Areas

							2021				2022				2023				2024				2025			
Study Area	Substation	Voltage (kV)	Feeder	SN Rating (Amps)	SE Rating (Amps)	Comments	Growth Rate	Spot Loads	Amps	%SN	Growth Rate	Spot Loads	Amps	%SN	Growth Rate	Spot Loads	Amps	%SN	Growth Rate	Spot Loads	Amps	%SN	Growth Rate	Spot Loads	Amps	%SN
East Bay	WARREN 5	12.47	5F3	515	515		0.1%		384	75%	0.2%		385	75%	0.1%		385	75%	0.1%		385	75%	0.1%		386	75%
East Bay	WARREN 5	12.47	5F4	510	510		0.1%		466	91%	0.2%		466	91%	0.1%		467	92%	0.1%		467	92%	0.1%		468	92%
East Bay	WATERMAN AVENUE 78	12.47	78F3	409	489		0.1%		353	86%	0.2%		354	87%	0.1%		354	87%	0.1%		355	87%	0.1%		355	87%
East Bay	WATERMAN AVENUE 78	12.47	78F4	409	489		0.1%		295	72%	0.2%		295	72%	0.1%		296	72%	0.1%		296	72%	0.1%		296	72%
Newport	BAILEY BROOK	4.16	19J14	476	476	Planned retire 2015 (Newport related)																				
Newport	BAILEY BROOK	4.16	19J16	476	476	Planned retire 2015 (Newport related)																				
Newport	BAILEY BROOK	4.16	19J2	447	476	Planned retire 2015 (Newport related)																				
Newport	CLARKE STREET	4.16	65J12	575	575	Planned Upgrade 2015	1.6%		448	78%	1.6%		455	79%	1.6%		463	80%	1.5%		470	82%	1.5%		477	83%
Newport	CLARKE STREET	4.16	65J2	570	595		1.6%		516	90%	1.6%		524	92%	1.6%		532	93%	1.5%		540	95%	1.5%		549	96%
Newport	DEXTER	13.8	36W41	464	566		1.6%		418	90%	1.6%		424	91%	1.6%		431	93%	1.5%		438	94%	1.5%		444	96%
Newport	DEXTER	13.8	36W42	464	515		1.6%		268	58%	1.6%		272	59%	1.6%		276	60%	1.5%		280	60%	1.5%		285	61%
Newport	DEXTER	13.8	36W43	464	566		1.6%		192	41%	1.6%		195	42%	1.6%		198	43%	1.5%		201	43%	1.5%		204	44%
Newport	DEXTER	13.8	36W44	464	566		1.6%		359	77%	1.6%		364	79%	1.6%		370	80%	1.5%		376	81%	1.5%		381	82%
Newport	ELDRED	4.16	45J2	448	476	Planned retire 2015																				
Newport	ELDRED	4.16	45J4	340	340	Planned retire 2015																				
Newport	ELDRED	4.16	45J6	448	476	Planned retire 2015																				
Newport	ELDRED NEW	4.16	45J1	530	600	Expected in-service 2015	1.6%		444	84%	1.6%		451	85%	1.6%		459	87%	1.5%		466	88%	1.5%		473	89%
Newport	ELDRED NEW	4.16	45J2	530	600	Expected in-service 2015	1.6%		342	65%	1.6%		348	66%	1.6%		353	67%	1.5%		358	68%	1.5%		364	69%
Newport	GATE II	4.16	38J2	440	476	Planned retire 2015 (Newport related)																				
Newport	GATE II	4.16	38J4	440	476	Planned retire 2015 (Newport related)																				
Newport	HARRISON	4.16	32J12	530	540		1.6%		416	78%	1.6%		422	80%	1.6%		429	81%	1.5%		436	82%	1.5%		442	83%
Newport	HARRISON	4.16	32J14	366	500		1.6%		373	102%	1.6%		379	103%	1.6%		385	105%	1.5%		391	107%	1.5%		396	108%
Newport	HARRISON	4.16	32J2	350	420		1.6%		287	82%	1.6%		292	83%	1.6%		296	85%	1.5%		301	86%	1.5%		305	87%
Newport	HARRISON	4.16	32J4	300	380		1.6%		156	52%	1.6%		158	53%	1.6%		161	54%	1.5%		163	54%	1.5%		166	55%
Newport	HOSPITAL	4.16	146J12	434	434		1.6%		178	41%	1.6%		181	42%	1.6%		184	42%	1.5%		186	43%	1.5%		189	44%
Newport	HOSPITAL	4.16	146J14	307	365		1.6%		156	51%	1.6%		158	52%	1.6%		161	52%	1.5%		163	53%	1.5%		166	54%
Newport	HOSPITAL	4.16	146J2	300	357		1.6%		160	53%	1.6%		163	54%	1.6%		165	55%	1.5%		168	56%	1.5%		170	57%
Newport	HOSPITAL	4.16	146J4	434	434		1.6%		253	58%	1.6%		257	59%	1.6%		261	60%	1.5%		265	61%	1.5%		269	62%
Newport	JEPSON	4.16	37J2	380	380	Planned retire 2015 (Newport related)																				
Newport	JEPSON	4.16	37J4	380	380	Planned retire 2015 (Newport related)																				
Newport	JEPSON	13.8	37W41	560	560		1.6%		234	42%	1.6%		238	43%	1.6%		242	43%	1.5%		246	44%	1.5%		249	45%
Newport	JEPSON	13.8	37W42	560	560		1.6%		422	75%	1.6%		429	77%	1.6%		436	78%	1.5%		443	79%	1.5%		449	80%
Newport	JEPSON	13.8	37W43	560	560		1.6%		388	69%	1.6%		394	70%	1.6%		401	72%	1.5%		407	73%	1.5%		413	74%
Newport	KINGSTON	4.16	131J12	380	380		1.6%		335	88%	1.6%		341	90%	1.6%		346	91%	1.5%		351	92%	1.5%		357	94%
Newport	KINGSTON	4.16	131J14	307	365		1.6%		288	94%	1.6%		293	95%	1.6%		298	97%	1.5%		302	98%	1.5%		307	100%
Newport	KINGSTON	4.16	131J2	397	510		1.6%		378	95%	1.6%		384	97%	1.6%		390	98%	1.5%		396	100%	1.5%		402	101%
Newport	KINGSTON	4.16	131J4	510	510		1.6%		339	67%	1.6%		345	68%	1.6%		350	69%	1.5%		356	70%	1.5%		361	71%
Newport	KINGSTON	4.16	131J6	380	380		1.6%		59	16%	1.6%		60	16%	1.6%		61	16%	1.5%		62	16%	1.5%		63	17%
Newport	MERTON	4.16	51J12	356	408		1.6%		156	44%	1.6%		158	44%	1.6%		161	45%	1.5%		163	46%	1.5%		166	47%
Newport	MERTON	4.16	51J14	310	368		1.6%		166	54%	1.6%		169	54%	1.6%		172	55%	1.5%		174	56%	1.5%		177	57%
Newport	MERTON	4.16	51J16	380	380		1.6%		312	82%	1.6%		317	83%	1.6%		322	85%	1.5%		327	86%	1.5%		332	87%
Newport	MERTON	4.16	51J2	310	333		1.6%		304	98%	1.6%		309	100%	1.6%		314	101%	1.5%		319	103%	1.5%		323	104%
Newport	NEWPORT SUB	13.8	W1	530	600	Expected in-service 2015	1.6%		293	55%	1.6%		298	56%	1.6%		303	57%	1.5%		307	58%	1.5%		312	59%
Newport	NEWPORT SUB	13.8	W2	530	600	Expected in-service 2015	1.6%		335	63%	1.6%		341	64%	1.6%		346	65%	1.5%		351	66%	1.5%		357	67%
Newport	NEWPORT SUB	13.8	W3	530	600	Expected in-service 2015	1.6%		318	60%	1.6%		323	61%	1.6%		328	62%	1.5%		333	63%	1.5%		338	64%
Newport	NEWPORT SUB	13.8	W4	530	600	Expected in-service 2015	1.6%		452	85%	1.6%		459	87%	1.6%		467	88%	1.5%		474	89%	1.5%		481	91%
Newport	NEWPORT SUB	13.8	W5	530	600	Expected in-service 2015	1.6%		231	44%	1.6%		235	44%	1.6%		238	45%	1.5%		242	46%	1.5%		246	46%
Newport	NO. AQUIDNECK	4.16	21J2	480	480		1.6%		196	41%	1.6%		199	42%	1.6%		203	42%	1.5%		206	43%	1.5%		209	43%
Newport	NO. AQUIDNECK	4.16	21J4	480	480		1.6%		370	77%	1.6%		376	78%	1.6%		382	80%	1.5%		388	81%	1.5%		393	82%
Newport	NO. AQUIDNECK	4.16	21J6	480	480	Planned retire 2015 (Newport related)																				
Newport	SO. AQUIDNECK	4.16	122J2	481	510		1.6%		468	97%	1.6%		475	99%	1.6%		483	100%	1.5%		490	102%	1.5%		497	103%
Newport	SO. AQUIDNECK	4.16	122J4	480	510		1.6%		252	53%	1.6%		257	53%	1.6%		261	54%	1.5%		265	55%	1.5%		269	56%
Newport	SO. AQUIDNECK	4.16	122J6	480	480	Planned retire 2015 (Newport related)																				
Newport	VERNON	4.16	23J12	384	408	Planned retire 2015 (Newport related)																				
Newport	VERNON	4.16	23J14	384	408	Planned retire 2015 (Newport related)																				
Newport	VERNON	4.16	23J2	384	408	Planned retire 2015 (Newport related)																				
Newport	VERNON	4.16	23J4	384	408	Planned retire 2015 (Newport related)																				
Newport	VERNON	4.16	23J6	384	408	Planned retire 2015 (Newport related)																				
Newport	WEST HOWARD	4.16	154J14	290	350		1.6%		268	92%	1.6%		272	94%	1.6%		277	95%	1.5%		281	97%	1.5%		285	98%
Newport	WEST HOWARD	4.16	154J16	270	340		1.6%		266	98%	1.6%		270	100%	1.6%		274	102%	1.5%		278	103%	1.5%		283	105%
Newport	WEST HOWARD	4.16	154J18	380	380		1.6%		374	98%	1.6%		380	100%	1.6%		386	102%	1.5%		392	103%	1.5%		398	105%
Newport	WEST HOWARD	4.16	154J2	480	688		1.6%		380	79%	1.6%		386	80%	1.6%		393	82%	1.5%		398	83%	1.5%		404	84%
Newport	WEST HOWARD	4.16	154J4	290	350		1.6%		274	94%	1.6%		278	96%	1.6%		283	97%	1.5%		287	99%	1.5%		291	100%
Newport	WEST HOWARD	4.16	154J6	268	346		1.6%		257	96%	1.6%		261	97%	1.6%		265	99%	1.5%		269	100%	1.5%		273	102%
Newport	WEST HOWARD	4.16	154J8	380	380		1.6%		359	94%	1.6%		364	96%	1.6%		370	97%	1.5%		376	99%	1.5%		381	100%
North Central RI	CENTREDALE 50	12.47	50F2	367	386		1.9%		282	77%	1.8%		287	78%	1.8%		292	80%	1.8%		297	81%	1.8%		302	82%
North Central RI	CENTREDALE 50	4.16	50J1	285	313		1.9%		205	72%	1.8%		209	73%	2.6%		214	75%	2.4%		219	77%	2.6%		225	79%
North Central RI	CENTREDALE 50	4.16	50J2	295	352		1.9%		0	0%	1.8%		0	0%	2.6%		0	0%	2.4%		0	0%	2.6%		0	0%
North Central RI	CENTREDALE 50	4.16	50J3	408	408		1.9%		307	75%	1.8%		313	77%	2.6%		321	79%	2.4%		329	81%	2.6%		337	83%
North Central RI	CHOPMIST 34	12.47	34F1	530	544		1.9%		484	91%	1.8%		492	93%	1.8%		501	95%	1.8%		510	96%	1.8%		520	98%
North Central RI	CHOPMIST 34	12.47	34F2	415	415		1.9%		392	94%	1.8%		399	96%	1.8%		406	98%	1.8%		414	100%	1.8%		421	101%
North Central RI	CHOPMIST 34	12.47	34F3	385	385		1.9%		348	90%	1.8%		354	92%	1.8%		360	94%	1.8%		367	95%	1.8%		373	97%
North Central RI	FARNUM PIKE 23	12.47	23F1	530	650		1.9%		445	84%	1.8%		453	85%	1.8%		461	87%	1.8%		469	89%	1.8%		478	90%
North Central RI	FARNUM PIKE 23	12.47	23F2	515	515		1.9%		501	97%	1.8%		510	99%	1.8%		520	101%	1.8%		529	103%	1.8%		538	105%
North Central RI	FARNUM PIKE 23	12.47	23F3	530	640		1.9%		392	74%	1.8%		399	75%	1.8%		406	77%	1.8%		413	78%	1.8%		421	79%
North Central RI	FARNUM PIKE 23	12.47	23F4	530	612		1.9%		361	68%	1.8%		368	69%	1.8%		374	71%	1.8%		381	72%	1.8%		388	73%
North Central RI	FARNUM PIKE 23	12.47	23F5	515	515		1.9%		154	30%	1.8%		156	30%	1.8%		159	31%	1.8%		162	31%	1.8%		165	32%
North Central RI	FARNUM PIKE 23	12.47	23F6	515	515		1.9%		492	96%	1.8%		501	97%	1.8%		510	99%	1.8%		519	101%	1.8%		528	103%
North Central RI	JOHNSTON 18	12.47	18F1	526	626		1.9%		464	88%	1.8%		473	90%	1.8%		481	91%	1.8%		490	93%	1.8%		499	95%
North Central RI	JOHNSTON 18	12.47	18F10	530	612	Expected in-service 2013	1.9%		379	72%	1.8%		386	73%	1.8%		393	74%	1.8%		400	75%	1.8%		407	77%
North Central RI	JOHNSTON 18	12.47	18F2	452	515		1.9%		420	93%	1.8%		428	95%	1.8%		436	96%	1.8%		444	98%	1.8%		452	100%
North Central RI	JOHNSTON 18	12.47	18F3	515	515		1.9%		409	79%	1.8%		416	81%	1.8%		424	82%	1.8%		431	84%	1.8%		439	85%
North Central RI	JOHNSTON 18	12.47	18F4	530	560		1.9%		334	63%	1.8%		340	64%	1.8%		346	65%	1.8%		353	67%	1.8%		359	68%

Feeders - Normal Configuration Summary
2012 Annual Planning
Rhode Island Study Areas

Study Area	Substation	Voltage (kV)	Feeder	SN Rating (Amps)	SE Rating (Amps)	Comments	2021 Growth Rate	2021 Spot Loads	2021 Amps	2021 %SN	2022 Growth Rate	2022 Spot Loads	2022 Amps	2022 %SN	2023 Growth Rate	2023 Spot Loads	2023 Amps	2023 %SN	2024 Growth Rate	2024 Spot Loads	2024 Amps	2024 %SN	2025 Growth Rate	2025 Spot Loads	2025 Amps	2025 %SN
North Central RI	JOHNSTON 18	12.47	18F5	530	612		1.9%		456	86%	1.8%		465	88%	1.8%		473	89%	1.8%		481	91%	1.8%		490	92%
North Central RI	JOHNSTON 18	12.47	18F6	515	515		1.9%		354	69%	1.8%		360	70%	1.8%		367	71%	1.8%		373	72%	1.8%		380	74%
North Central RI	JOHNSTON 18	12.47	18F7	530	612		1.9%		434	82%	1.8%		442	83%	1.8%		450	85%	1.8%		458	86%	1.8%		466	88%
North Central RI	JOHNSTON 18	12.47	18F8	530	612		1.9%		358	68%	1.8%		364	69%	1.8%		371	70%	1.8%		378	71%	1.8%		384	73%
North Central RI	JOHNSTON 18	12.47	18F9	530	612		1.9%		530	100%	1.8%		539	102%	1.8%		549	104%	1.8%		559	105%	1.8%		569	107%
North Central RI	MANTON 69	12.47	69F1	515	515		1.9%		465	90%	1.8%		473	92%	1.8%		481	93%	1.8%		490	95%	1.8%		499	97%
North Central RI	MANTON 69	12.47	69F3	502	515		1.9%		444	88%	1.8%		452	90%	1.8%		460	92%	1.8%		469	93%	1.8%		477	95%
North Central RI	PUTNAM PIKE 38	12.47	38F1	530	650		1.9%		493	93%	1.8%		501	95%	1.8%		510	96%	1.8%		520	98%	1.8%		529	100%
North Central RI	PUTNAM PIKE 38	12.47	38F2	530	650		1.9%		394	74%	1.8%		401	76%	1.8%		409	77%	1.8%		416	78%	1.8%		423	80%
North Central RI	PUTNAM PIKE 38	12.47	38F3	530	650		1.9%		450	85%	1.8%		458	86%	1.8%		466	88%	1.8%		475	90%	1.8%		483	91%
North Central RI	PUTNAM PIKE 38	12.47	38F4	515	515		1.9%		314	61%	1.8%		319	62%	1.8%		325	63%	1.8%		331	64%	1.8%		337	65%
North Central RI	PUTNAM PIKE 38	12.47	38F5	530	612		1.9%		460	87%	1.8%		469	88%	1.8%		477	90%	1.8%		486	92%	1.8%		494	93%
North Central RI	PUTNAM PIKE 38	12.47	38F6	530	612		1.9%		474	90%	1.8%		483	91%	1.8%		492	93%	1.8%		500	94%	1.8%		509	96%
North Central RI	SHUNPIKE SIMS	13.2	35F8	700	765	Expected in-service 2014	1.9%		556	79%	1.8%		566	81%	2.6%		581	83%	2.4%		595	85%	2.6%		610	87%
North Central RI	SHUNPIKE 35	12.47	35F1	543	727	Expected in-service 2018	1.9%		212	39%	1.8%		215	40%	2.6%		221	41%	2.4%		226	42%	2.6%		232	43%
North Central RI	SHUNPIKE 35	12.47	35F2	538	698	Expected in-service 2018	1.9%		204	38%	1.8%		208	39%	2.6%		213	40%	2.4%		218	41%	2.6%		224	42%
North Central RI	SHUNPIKE 35	12.47	35F3	510	694	Expected in-service 2018	1.9%		174	34%	1.8%		177	35%	2.6%		181	36%	2.4%		186	36%	2.6%		190	37%
North Central RI	WEST CRANSTON 21	12.47	21F1	515	515		1.9%		439	85%	1.8%		447	87%	1.8%		455	88%	1.8%		463	90%	1.8%		472	92%
North Central RI	WEST CRANSTON 21	12.47	21F2	515	515		1.9%		528	103%	1.8%		538	104%	1.8%		547	106%	1.8%		557	108%	1.8%		567	110%
North Central RI	WEST CRANSTON 21	12.47	21F4	515	515		1.9%		494	96%	1.8%		503	98%	1.8%		512	99%	1.8%		522	101%	1.8%		531	103%
North Central RI	WEST GREENVILLE 45	12.47	45F2	425	520		1.9%		151	36%	1.8%		154	36%	1.8%		156	37%	1.8%		159	37%	1.8%		162	38%
Providence	ADMIRAL STREET 9	11.5	1115	250	250		0.2%		54		0.2%		54		0.1%		54		0.1%		54		0.1%		54	
Providence	ADMIRAL STREET 9	11.5	1117	250	250		0.2%		174		0.2%		174		0.1%		174		0.1%		174		0.1%		174	
Providence	ADMIRAL STREET 9	11.5	1119	250	250		0.2%		83		0.2%		83		0.1%		83		0.1%		83		0.1%		84	
Providence	ADMIRAL STREET 9	4.16	9J1	297	326		0.2%		293	99%	0.2%		293	99%	0.1%		294	99%	0.1%		294	99%	0.1%		294	99%
Providence	ADMIRAL STREET 9	4.16	9J2	369	441		0.2%		174	47%	0.2%		174	47%	0.1%		174	47%	0.1%		174	47%	0.1%		174	47%
Providence	ADMIRAL STREET 9	4.16	9J3	255	255		0.2%		211	83%	0.2%		211	83%	0.1%		212	83%	0.1%		212	83%	0.1%		212	83%
Providence	ADMIRAL STREET 9	4.16	9J5	297	326		0.2%		166	56%	0.2%		166	56%	0.1%		166	56%	0.1%		167	56%	0.1%		167	56%
Providence	CLARKSON STREET 13	12.47	13F1	400	533		0.2%		319	80%	0.2%		320	80%	0.1%		320	80%	0.1%		320	80%	0.1%		321	80%
Providence	CLARKSON STREET 13	12.47	13F10	400	533	Expeted in-service 2013	0.2%		254	64%	0.2%		255	64%	0.1%		255	64%	0.1%		255	64%	0.1%		256	64%
Providence	CLARKSON STREET 13	12.47	13F2	540	612		0.2%		488	90%	0.2%		489	91%	0.1%		490	91%	0.1%		490	91%	0.1%		490	91%
Providence	CLARKSON STREET 13	12.47	13F3	425	612		0.2%		412	97%	0.2%		412	97%	0.1%		413	97%	0.1%		413	97%	0.1%		414	97%
Providence	CLARKSON STREET 13	12.47	13F4	520	612		0.2%		514	99%	0.2%		515	99%	0.1%		516	99%	0.1%		516	99%	0.1%		517	99%
Providence	CLARKSON STREET 13	12.47	13F5	455	612		0.2%		363	80%	0.2%		364	80%	0.1%		364	80%	0.1%		365	80%	0.1%		365	80%
Providence	CLARKSON STREET 13	12.47	13F6	415	542		0.2%		230	55%	0.2%		230	56%	0.1%		231	56%	0.1%		231	56%	0.1%		231	56%
Providence	CLARKSON STREET 13	12.47	13F7	436	571		0.2%		272	62%	0.2%		273	63%	0.1%		273	63%	0.1%		273	63%	0.1%		274	63%
Providence	CLARKSON STREET 13	12.47	13F8	437	563		0.2%		302	69%	0.2%		302	69%	0.1%		303	69%	0.1%		303	69%	0.1%		303	69%
Providence	CLARKSON STREET 13	12.47	13F9	530	612		0.2%		503	95%	0.2%		504	95%	0.1%		504	95%	0.1%		505	95%	0.1%		505	95%
Providence	DYER STREET 2	11.5	1103	250	250		0.2%		180		0.2%		180		0.1%		181		0.1%		181		0.1%		181	
Providence	DYER STREET 2	4.16	2J1	408	408		0.2%		369	90%	0.2%		369	91%	0.1%		370	91%	0.1%		370	91%	0.1%		371	91%
Providence	DYER STREET 2	4.16	2J10	354	354		0.2%		206	58%	0.2%		206	58%	0.1%		207	58%	0.1%		207	58%	0.1%		207	59%
Providence	DYER STREET 2	4.16	2J2	285	313		0.2%		152	53%	0.2%		152	53%	0.1%		152	53%	0.1%		152	53%	0.1%		153	54%
Providence	DYER STREET 2	4.16	2J3	297	326		0.2%		87	29%	0.2%		87	29%	0.1%		87	29%	0.1%		87	29%	0.1%		87	29%
Providence	DYER STREET 2	4.16	2J4	340	340		0.2%		188	55%	0.2%		188	55%	0.1%		189	55%	0.1%		189	56%	0.1%		189	56%
Providence	DYER STREET 2	4.16	2J5	354	354		0.2%		139	39%	0.2%		139	39%	0.1%		139	39%	0.1%		139	39%	0.1%		140	39%
Providence	DYER STREET 2	4.16	2J7	354	354		0.2%		249	70%	0.2%		250	71%	0.1%		250	71%	0.1%		250	71%	0.1%		251	71%
Providence	DYER STREET 2	4.16	2J8	354	354		0.2%		206	58%	0.2%		206	58%	0.1%		207	58%	0.1%		207	58%	0.1%		207	59%
Providence	DYER STREET 2	4.16	2J9	340	340		0.2%		289	85%	0.2%		290	85%	0.1%		290	85%	0.1%		290	85%	0.1%		291	85%
Providence	EAST GEORGE ST 77	4.16	77J1	371	408		0.2%		286	77%	0.2%		286	77%	0.1%		286	77%	0.1%		287	77%	0.1%		287	77%
Providence	EAST GEORGE ST 77	4.16	77J2	364	495		0.2%		345	95%	0.2%		346	95%	0.1%		346	95%	0.1%		346	95%	0.1%		347	95%
Providence	EAST GEORGE ST 77	4.16	77J3	371	385		0.2%		333	90%	0.2%		333	90%	0.1%		334	90%	0.1%		334	90%	0.1%		334	90%
Providence	EAST GEORGE ST 77	4.16	77J4	364	495		0.2%		325	89%	0.2%		326	90%	0.1%		326	90%	0.1%		327	90%	0.1%		327	90%
Providence	ELMWOOD 7 - OUTDOOR	12.47	7F1	530	612		0.2%		416	79%	0.2%		417	79%	0.1%		418	79%	0.1%		418	79%	0.1%		419	79%
Providence	ELMWOOD 7 - OUTDOOR	12.47	7F2	530	612		0.2%		504	95%	0.2%		505	95%	0.1%		506	95%	0.1%		506	96%	0.1%		507	96%
Providence	ELMWOOD 7 - OUTDOOR	12.47	7F4	530	612		0.2%		492	93%	0.2%		493	93%	0.1%		494	93%	0.1%		494	93%	0.1%		495	93%
Providence	FRANKLIN SQUARE 11	11.5	1112	280	280		0.2%		69	25%	0.2%		69	25%	0.1%		69	25%	0.1%		69	25%	0.1%		69	25%
Providence	FRANKLIN SQUARE 11	11.5	1121	363	455		0.2%		96	26%	0.2%		96	27%	0.1%		96	27%	0.1%		97	27%	0.1%		97	27%
Providence	FRANKLIN SQUARE 11	11.5	1123	404	404		0.2%		51	13%	0.2%		51	13%	0.1%		51	13%	0.1%		52	13%	0.1%		52	13%
Providence	FRANKLIN SQUARE 11	11.5	1125	696	834		0.2%		213	31%	0.2%		213	31%	0.1%		214	31%	0.1%		214	31%	0.1%		214	31%
Providence	FRANKLIN SQUARE 11	11.5	1126	327	450		0.2%		236	72%	0.2%		236	72%	0.1%		236	72%	0.1%		237	72%	0.1%		237	72%
Providence	FRANKLIN SQUARE 11	11.5	1149	250	250		0.2%		62	25%	0.2%		62	25%	0.1%		62	25%	0.1%		62	25%	0.1%		62	25%
Providence	FRANKLIN SQUARE 11	11.5	1153	313	350		0.2%		177	57%	0.2%		178	57%	0.1%		178	57%	0.1%		178	57%	0.1%		178	57%
Providence	GENEVA 71	4.16	71J1	285	313		0.2%		247	87%	0.2%		248	87%	0.1%		248	87%	0.1%		248	87%	0.1%		249	87%
Providence	GENEVA 71	4.16	71J2	379	408		0.2%		162	43%	0.2%		162	43%	0.1%		162	43%	0.1%		163	43%	0.1%		163	43%
Providence	GENEVA 71	4.16	71J3	379	408		0.2%		204	54%	0.2%		204	54%	0.1%		205	54%	0.1%		205	54%	0.1%		205	54%
Providence	GENEVA 71	4.16	71J4	342	408		0.2%		230	67%	0.2%		230	67%	0.1%		231	67%	0.1%		231	67%	0.1%		231	68%
Providence	GENEVA 71	4.16	71J5	342	408		0.2%		338	99%	0.2%		339	99%	0.1%		339	99%	0.1%		340	99%	0.1%		340	99%
Providence	HARRIS AVENUE 12	11.5	1131	250	250		0.2%		78	31%	0.2%		78	31%	0.1%		78	31%	0.1%		78	31%	0.1%		78	31%
Providence	HARRIS AVENUE 12	4.16	12J1	285	313		0.2%		72	25%	0.2%		72	25%	0.1%		73	25%	0.1%		73	25%	0.1%		73	25%
Providence	HARRIS AVENUE 12	4.16	12J2	379	416		0.2%		282	74%	0.2%		283	75%	0.1%		283	75%	0.1%		283	75%	0.1%		283	75%
Providence	HARRIS AVENUE 12	4.16	12J3	285	313		0.2%		163	57%	0.2%		163	57%	0.1%		163	57%	0.1%		163	57%	0.1%		163	57%
Providence	HARRIS AVENUE 12	4.16	12J4	297	326		0.2%		296	100%	0.2%		297	100%	0.1%		297	100%	0.1%		298	100%	0.1%		298	100%
Providence	HARRIS AVENUE 12	4.16	12J5	297	326		0.2%		108	37%	0.2%		109	37%	0.1%		109	37%	0.1%		109	37%	0.1%		109	37%
Providence	HARRIS AVENUE 12	4.16	12J6	297	326		0.2%		163	55%	0.2%		163	55%	0.1%		163	55%	0.1%		163	55%	0.1%		163	55%
Providence	HUNTINGTON PARK 67	4.16	67J1	354	423		0.2%		277	78%	0.2%		278	78%	0.1%		278	79%	0.1%		278	79%	0.1%		279	79%
Providence	KNIGHTSVILLE 66	4.16	66J1	315	405		0.2%		252	80%	0.2%		252	80%	0.1%		252	80%	0.1%		253	80%	0.1%		253	80%
Providence	KNIGHTSVILLE 66	4.16	66J2	379	408		0.2%		356	94%	0.2%		356	94%	0.1%		357	94%	0.1%		357	94%	0.1%		358	94%
Providence	KNIGHTSVILLE 66	4.16	66J3	379	408		0.2%		377	100%	0.2%		378	100%	0.1%		379	100%	0.1%		379	100%	0.1%		379	100%
Providence	KNIGHTSVILLE 66	4.16	66J4	379	408		0.2%		282	74%	0.2%		283	75%	0.1%		283	75%	0.1%		283	75%	0.1%		283	75%
Providence	KNIGHTSVILLE 66	4.16	66J5	379	408		0.2%		299	79%	0.2%		300	79%	0.1%		300	79%	0.1%		301	79%	0.1%		301	79%
Providence	LIPPITT HILL 79	12.47	79F1	459	579		0.2%		358	78%	0.2%		359	78%	0.1%		359	78%	0.1%		359	78%	0.1%		360	78%
Providence	LIPPITT HILL 79	12.47	79F2	459	579		0.2%		415	90%	0.2%		416	91%	0.1%		417	91%	0.1%		417	91%	0.1%		417	91%
Providence	OLNEYVILLE 6	4.16	6J1	306	354		0.2%		204	67%	0.2%		204	67%	0.1%		205	67%	0.1%		205	67%	0.1%		205	67%

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							2021				2022				2023				2024				2025			
Study Area	Substation	Voltage (kV)	Feeder	SN Rating (Amps)	SE Rating (Amps)	Comments	Growth Rate	Spot Loads	Amps	%SN	Growth Rate	Spot Loads	Amps	%SN	Growth Rate	Spot Loads	Amps	%SN	Growth Rate	Spot Loads	Amps	%SN	Growth Rate	Spot Loads	Amps	%SN
Providence	OLNEYVILLE 6	4.16	6J2	306	354		0.2%		237	77%	0.2%		238	78%	0.1%		238	78%	0.1%		238	78%	0.1%		238	78%
Providence	OLNEYVILLE 6	4.16	6J3	306	354		0.2%		127	42%	0.2%		128	42%	0.1%		128	42%	0.1%		128	42%	0.1%		128	42%
Providence	OLNEYVILLE 6	4.16	6J5	306	354		0.2%		117	38%	0.2%		117	38%	0.1%		117	38%	0.1%		118	38%	0.1%		118	38%
Providence	OLNEYVILLE 6	4.16	6J6	306	354		0.2%		150	49%	0.2%		150	49%	0.1%		150	49%	0.1%		150	49%	0.1%		150	49%
Providence	OLNEYVILLE 6	4.16	6J7	306	354		0.2%		230	75%	0.2%		230	75%	0.1%		231	75%	0.1%		231	75%	0.1%		231	76%
Providence	OLNEYVILLE 6	4.16	6J8	306	354		0.2%		70	23%	0.2%		71	23%	0.1%		71	23%	0.1%		71	23%	0.1%		71	23%
Providence	POINT STREET 76	12.47	76F1	484	490		0.2%		454	94%	0.2%		455	94%	0.1%		455	94%	0.1%		456	94%	0.1%		456	94%
Providence	POINT STREET 76	12.47	76F2	500	612		0.2%		456	91%	0.2%		457	91%	0.1%		458	92%	0.1%		458	92%	0.1%		459	92%
Providence	POINT STREET 76	12.47	76F3	546	653		0.2%		251	46%	0.2%		252	46%	0.1%		252	46%	0.1%		252	46%	0.1%		252	46%
Providence	POINT STREET 76	12.47	76F4	530	612		0.2%		536	101%	0.2%		537	101%	0.1%		538	101%	0.1%		538	102%	0.1%		539	102%
Providence	POINT STREET 76	12.47	76F5	448	570		0.2%		450	100%	0.2%		451	101%	0.1%		451	101%	0.1%		451	101%	0.1%		452	101%
Providence	POINT STREET 76	12.47	76F6	518	612		0.2%		517	100%	0.2%		518	100%	0.1%		519	100%	0.1%		519	100%	0.1%		520	100%
Providence	POINT STREET 76	12.47	76F7	525	612		0.2%		495	94%	0.2%		496	94%	0.1%		496	94%	0.1%		497	95%	0.1%		497	95%
Providence	POINT STREET 76	12.47	76F8	530	612		0.2%		258	49%	0.2%		259	49%	0.1%		259	49%	0.1%		259	49%	0.1%		259	49%
Providence	ROCHAMBEAU AVENUE 37	4.16	37J1	329	408		0.2%		260	79%	0.2%		261	79%	0.1%		261	79%	0.1%		261	79%	0.1%		262	80%
Providence	ROCHAMBEAU AVENUE 37	4.16	37J2	291	349		0.2%		268	92%	0.2%		268	92%	0.1%		268	92%	0.1%		269	92%	0.1%		269	92%
Providence	ROCHAMBEAU AVENUE 37	4.16	37J3	303	408		0.2%		266	88%	0.2%		266	88%	0.1%		267	88%	0.1%		267	88%	0.1%		267	88%
Providence	ROCHAMBEAU AVENUE 37	4.16	37J4	278	371		0.2%		257	92%	0.2%		258	93%	0.1%		258	93%	0.1%		258	93%	0.1%		258	93%
Providence	ROCHAMBEAU AVENUE 37	4.16	37J5	347	408		0.2%		252	73%	0.2%		252	73%	0.1%		252	73%	0.1%		253	73%	0.1%		253	73%
Providence	SOUTH STREET 1	11.5	1101	250	250		0.2%		237		0.2%		238		0.1%		238		0.1%		238		0.1%		238	
Providence	SOUTH STREET 1	11.5	1151	322	375		0.2%		249	77%	0.2%		250	78%	0.1%		250	78%	0.1%		250	78%	0.1%		250	78%
Providence	SPRAGUE STREET 36	4.16	36J1	236	283		0.2%		195	83%	0.2%		196	83%	0.1%		196	83%	0.1%		196	83%	0.1%		196	83%
Providence	SPRAGUE STREET 36	4.16	36J2	252	299		0.2%		193	77%	0.2%		194	77%	0.1%		194	77%	0.1%		194	77%	0.1%		194	77%
Providence	SPRAGUE STREET 36	4.16	36J4	344	405		0.2%		257	75%	0.2%		257	75%	0.1%		257	75%	0.1%		258	75%	0.1%		258	75%
Providence	SPRAGUE STREET 36	4.16	36J5	315	315		0.2%		192	61%	0.2%		192	61%	0.1%		192	61%	0.1%		192	61%	0.1%		193	61%
South County East	BONNET 42	12.47	42F1	525	566		1.9%		576	110%	1.8%		587	112%	1.8%		597	114%	1.8%		608	116%	1.7%		618	118%
South County East	LAFAYETTE 30	12.47	30F1	350	385		1.9%		304	87%	1.8%		310	89%	1.8%		316	90%	1.8%		321	92%	1.7%		327	93%
South County East	LAFAYETTE 30	12.47	30F2	546	578		1.9%		525	96%	1.8%		534	98%	1.8%		544	100%	1.8%		554	101%	1.7%		563	103%
South County East	OLD BAPTIST ROAD 46	12.47	46F1	530	612		1.9%		533	101%	1.8%		543	102%	1.8%		553	104%	1.8%		563	106%	1.7%		572	108%
South County East	OLD BAPTIST ROAD 46	12.47	46F2	530	612		1.9%		536	101%	1.8%		546	103%	1.8%		555	105%	1.8%		565	107%	1.7%		575	109%
South County East	OLD BAPTIST ROAD 46	12.47	46F3	565	612		1.9%		566	100%	1.8%		576	102%	1.8%		586	104%	1.8%		597	106%	1.7%		607	107%
South County East	OLD BAPTIST ROAD 46	12.47	46F4	594	612		1.9%		586	99%	1.8%		597	100%	1.8%		607	102%	1.8%		618	104%	1.7%		629	106%
South County East	PEACEDALE 59	12.47	59F1	409	476		1.9%		195	48%	1.8%		199	49%	1.8%		202	49%	1.8%		206	50%	1.7%		209	51%
South County East	PEACEDALE 59	12.47	59F2	515	515		1.9%		392	76%	1.8%		399	77%	1.8%		406	79%	1.8%		413	80%	1.7%		420	82%
South County East	PEACEDALE 59	12.47	59F3	521	578		1.9%		548	105%	1.8%		558	107%	1.8%		568	109%	1.8%		578	111%	1.7%		588	113%
South County East	PEACEDALE 59	12.47	59F4	409	489		1.9%		207	51%	1.8%		211	52%	1.8%		215	53%	1.8%		219	53%	1.7%		222	54%
South County East	QUONSET 83	12.47	83F1	560	645		1.9%		167	30%	1.8%		170	30%	1.8%		173	31%	1.8%		176	31%	1.7%		179	32%
South County East	QUONSET 83	12.47	83F2	530	650		1.9%		497	94%	1.8%		506	96%	1.8%		515	97%	1.8%		525	99%	1.7%		534	101%
South County East	QUONSET 83	12.47	83F3	560	645		1.9%		254	45%	1.8%		259	46%	1.8%		264	47%	1.8%		268	48%	1.7%		273	49%
South County East	TOWER HILL 88	12.47	88F1	530	650		1.9%		483	91%	1.8%		492	93%	1.8%		501	95%	1.8%		510	96%	1.7%		519	98%
South County East	TOWER HILL 88	12.47	88F3	548	645		1.9%		587	107%	1.8%		598	109%	1.8%		608	111%	1.8%		619	113%	1.7%		630	115%
South County East	TOWER HILL 88	12.47	88F5	530	650		1.9%		451	85%	1.8%		459	87%	1.8%		468	88%	1.8%		476	90%	1.7%		484	91%
South County East	TOWER HILL 88	12.47	88F7	530	650	Expected in-service 2014	1.9%		472	89%	1.8%		481	91%	1.8%		489	92%	1.8%		498	94%	1.7%		506	96%
South County East	WAKEFIELD 17	12.47	17F1	602	645	Feeder Upgrade in 2014	1.9%		621	103%	1.8%		632	105%	1.8%		643	107%	1.8%		655	109%	1.7%		666	111%
South County East	WAKEFIELD 17	12.47	17F2	510	510		1.9%		481	94%	1.8%		489	96%	1.8%		498	98%	1.8%		507	99%	1.7%		516	101%
South County East	WAKEFIELD 17	12.47	17F3	597	626		1.9%		575	96%	1.8%		585	98%	1.8%		596	100%	1.8%		607	102%	1.7%		617	103%
South County West	ASHAWAY 43	12.47	43F1	388	423	Planned retire 2014 (Hopkinton related)																				
South County West	HOPE VALLEY 41	12.47	41F1	347	430	Planned retire 2014 (Hopkinton related)																				
South County West	HOPKINTON	12.47	F1	515	515	Expected in-service 2014	1.9%		361	70%	1.8%		368	71%	1.8%		374	73%	1.8%		381	74%	1.7%		388	75%
South County West	HOPKINTON	12.47	F2	645	645	Expected in-service 2014	1.9%		396	61%	1.8%		403	63%	1.8%		411	64%	1.8%		418	65%	1.7%		425	66%
South County West	HOPKINTON	12.47	F3	530	650	Expected in-service 2014	1.9%		513	97%	1.8%		522	99%	1.8%		532	100%	1.8%		541	102%	1.7%		550	104%
South County West	HOPKINTON	12.47	F4	645	645	Expected in-service 2014	1.9%		559	87%	1.8%		570	88%	1.8%		580	90%	1.8%		590	92%	1.7%		600	93%
South County West	HOPKINTON	12.47	F5	530	650	Expected in-service 2014	1.9%		478	90%	1.8%		487	92%	1.8%		495	93%	1.8%		504	95%	1.7%		513	97%
South County West	HOPKINTON	12.47	F6	645	645	Expected in-service 2014	1.9%		501	78%	1.8%		510	79%	1.8%		519	81%	1.8%		529	82%	1.7%		538	83%
South County West	HOPKINTON	13.47	F7	315	315	Expected in-service 2014	1.9%		326	104%	1.8%		332	105%	1.8%		338	107%	1.8%		344	109%	1.7%		350	111%
South County West	KENYON 68	12.47	68F1	512	612		1.9%		455	89%	1.8%		463	90%	1.8%		472	92%	1.8%		480	94%	1.7%		488	95%
South County West	KENYON 68	12.47	68F2	511	612		1.9%		559	109%	1.8%		569	111%	1.8%		579	113%	1.8%		590	115%	1.7%		600	117%
South County West	KENYON 68	12.47	68F3	512	515		1.9%		515	101%	1.8%		525	102%	1.8%		534	104%	1.8%		544	106%	1.7%		553	108%
South County West	KENYON 68	12.47	68F4	514	612		1.9%		428	83%	1.8%		436	85%	1.8%		444	86%	1.8%		452	88%	1.7%		459	89%
South County West	KENYON 68	12.47	68F5	612	612		1.9%		380	62%	1.8%		387	63%	1.8%		394	64%	1.8%		401	65%	1.7%		407	67%
South County West	LANGWORTHY 86	12.47	86F1	640	648	Limiting element upgraded (transformer) 2014	1.9%		537	84%	1.8%		546	85%	1.8%		556	87%	1.8%		566	88%	1.7%		576	90%
South County West	WESTERLY 16	12.47	16F1	515	515	Planned retire 2014 (Hopkinton related)																				
South County West	WESTERLY 16	12.47	16F2	515	515	Planned retire 2014 (Hopkinton related)																				
South County West	WESTERLY 16	12.47	16F3	515	515	Planned retire 2014 (Hopkinton related)																				
South County West	WESTERLY 16	12.47	16F4	645	645	Planned retire 2014 (Hopkinton related)																				
Tiverton	TIVERTON	12.47	33F1	478	515		0.1%		330	69%	0.2%		330	69%	0.1%		331	69%	0.1%		331	69%	0.1%		331	69%
Tiverton	TIVERTON	12.47	33F2	456	515		0.1%		365	80%	0.2%		365	80%	0.1%		366	80%	0.1%		366	80%	0.1%		367	80%
Tiverton	TIVERTON	12.47	33F3	478	600		0.1%		432	90%	0.2%		433	91%	0.1%		433	91%	0.1%		434	91%	0.1%		434	91%
Tiverton	TIVERTON	12.47	33F4	456	576		0.1%		476	104%	0.2%		477	105%	0.1%		477	105%	0.1%		478	105%	0.1%		478	105%

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Study Area	Substation	Voltage (kV)	Feeder	SN Rating (Amps)	SE Rating (Amps)	Comments	2026 Growth Rate	2026 Spot Loads	2026 Amps	2026 %SN	2027 Growth Rate	2027 Spot Loads	2027 Amps	2027 %SN	2028 Growth Rate	2028 Spot Loads	2028 Amps	2028 %SN
Blackstone Valley North	FARNUM	23	105K1	515	515		0.1%		102	20%	0.1%		102	20%	0.1%		103	20%
Blackstone Valley North	HIGHLAND DRIVE	13.8	F1	585	585	Estimated in-service 2014	0.1%		314	54%	0.1%		315	54%	0.1%		315	54%
Blackstone Valley North	HIGHLAND DRIVE	13.8	F2	585	585	Estimated in-service 2014	0.1%		267	46%	0.1%		268	46%	0.1%		268	46%
Blackstone Valley North	HIGHLAND DRIVE	13.8	F3	585	585	Estimated in-service 2014	0.1%		295	50%	0.1%		295	50%	0.1%		295	50%
Blackstone Valley North	HIGHLAND DRIVE	13.8	F4	585	585	Estimated in-service 2014	0.1%		33	6%	0.1%		33	6%	0.1%		33	6%
Blackstone Valley North	HIGHLAND DRIVE	13.8	F5	515	515	Estimated in-service 2014	0.1%		402	78%	0.1%		402	78%	0.1%		403	78%
Blackstone Valley North	HIGHLAND DRIVE	13.8	F6	585	585	Estimated in-service 2014	0.1%		446	76%	0.1%		446	76%	0.1%		447	76%
Blackstone Valley North	NASONVILLE	13.8	127W43	585	585		0.1%		323	55%	0.1%		324	55%	0.1%		324	55%
Blackstone Valley North	NASONVILLE	13.8	127W40	461	515		0.1%		380	82%	0.1%		381	83%	0.1%		381	83%
Blackstone Valley North	NASONVILLE	13.8	127W41	432	515		0.1%		276	64%	0.1%		276	64%	0.1%		276	64%
Blackstone Valley North	NASONVILLE	13.8	127W42	458	515		0.1%		323	71%	0.1%		324	71%	0.1%		324	71%
Blackstone Valley North	RIVERSIDE 8	13.8	108W51	499	631		0.1%		434	87%	0.1%		435	87%	0.1%		435	87%
Blackstone Valley North	RIVERSIDE 8	13.8	108W53	499	631		0.1%		442	88%	0.1%		442	89%	0.1%		442	89%
Blackstone Valley North	RIVERSIDE 8	13.8	108W55	474	474		0.1%		35	7%	0.1%		35	7%	0.1%		35	7%
Blackstone Valley North	RIVERSIDE 8	13.8	108W60	515	515		0.1%		320	62%	0.1%		320	62%	0.1%		321	62%
Blackstone Valley North	RIVERSIDE 8	13.8	108W61	500	500		0.1%		127	25%	0.1%		127	25%	0.1%		127	25%
Blackstone Valley North	RIVERSIDE 8	13.8	108W62	515	515		0.1%		273	53%	0.1%		274	53%	0.1%		274	53%
Blackstone Valley North	RIVERSIDE 8	13.8	108W63	515	515		0.1%		102	20%	0.1%		102	20%	0.1%		102	20%
Blackstone Valley North	RIVERSIDE 8	13.8	108W65	515	515		0.1%		347	67%	0.1%		347	67%	0.1%		348	67%
Blackstone Valley North	STAPLES 112	13.8	112W41	515	515		0.1%		128	39%	0.1%		129	39%	0.1%		129	39%
Blackstone Valley North	STAPLES 112	13.8	112W42	500	599		0.1%		460	92%	0.1%		461	92%	0.1%		461	92%
Blackstone Valley North	STAPLES 112	13.8	112W43	515	515		0.1%		169	46%	0.1%		170	46%	0.1%		170	46%
Blackstone Valley North	STAPLES 112	13.8	112W44	406	484		0.1%		406	100%	0.1%		407	100%	0.1%		407	100%
Blackstone Valley North	WOONSOCKET	13.8	26W41	515	515	In-Service 2012	0.1%		319	62%	0.1%		319	62%	0.1%		319	62%
Blackstone Valley North	WOONSOCKET	13.8	26W42	515	515	In-Service 2012	0.1%		297	58%	0.1%		297	58%	0.1%		298	58%
Blackstone Valley North	WOONSOCKET	13.8	26W43	515	515	In-Service 2012	0.1%		479	93%	0.1%		479	93%	0.1%		480	93%
Blackstone Valley South	CENTRAL FALLS SUB	4.16	104J1	350	350		0.1%		81	23%	0.1%		81	23%	0.1%		81	23%
Blackstone Valley South	CENTRAL FALLS SUB	4.16	104J3	350	350		0.1%		125	36%	0.1%		125	36%	0.1%		125	36%
Blackstone Valley South	CENTRAL FALLS SUB	4.16	104J5	350	350		0.1%		172	49%	0.1%		172	49%	0.1%		173	49%
Blackstone Valley South	CENTRAL FALLS SUB	4.16	104J7	350	350		0.1%		167	48%	0.1%		167	48%	0.1%		168	48%
Blackstone Valley South	CENTRE ST	4.16	106J1	350	350		0.1%		116	33%	0.1%		116	33%	0.1%		117	33%
Blackstone Valley South	CENTRE ST	4.16	106J3	350	350		0.1%		163	46%	0.1%		163	47%	0.1%		163	47%
Blackstone Valley South	CENTRE ST	4.16	106J7	350	350		0.1%		65	18%	0.1%		65	18%	0.1%		65	19%
Blackstone Valley South	COTTAGE STREET SUB	4.16	109J1	408	408		0.1%		337	83%	0.1%		337	83%	0.1%		337	83%
Blackstone Valley South	COTTAGE STREET SUB	4.16	109J3	408	408		0.1%		256	63%	0.1%		256	63%	0.1%		256	63%
Blackstone Valley South	COTTAGE STREET SUB	4.16	109J5	408	408		0.1%		303	74%	0.1%		303	74%	0.1%		303	74%
Blackstone Valley South	CROSSMAN STREET SUB	4.16	111J1	350	350		0.1%		269	77%	0.1%		270	77%	0.1%		270	77%
Blackstone Valley South	CROSSMAN STREET SUB	4.16	111J3	350	350		0.1%		182	52%	0.1%		182	52%	0.1%		182	52%
Blackstone Valley South	DAGGETT SUB	4.16	113J1	390	390		0.1%		171	44%	0.1%		171	44%	0.1%		172	44%
Blackstone Valley South	DAGGETT SUB	4.16	113J2	390	390		0.1%		134	34%	0.1%		134	34%	0.1%		134	34%
Blackstone Valley South	FRONT ST. SUB	4.16	24J1	350	350		0.1%		162	46%	0.1%		162	46%	0.1%		162	46%
Blackstone Valley South	HYDE SUB	4.16	28J1	400	400		0.1%		118	30%	0.1%		119	30%	0.1%		119	30%
Blackstone Valley South	HYDE SUB	4.16	28J2	400	400		0.1%		166	41%	0.1%		166	42%	0.1%		166	42%
Blackstone Valley South	LEE STREET SUB	4.16	30J1	380	380		0.1%		215	57%	0.1%		216	57%	0.1%		216	57%
Blackstone Valley South	LEE STREET SUB	4.16	30J3	380	380		0.1%		345	91%	0.1%		345	91%	0.1%		345	91%
Blackstone Valley South	LEE STREET SUB	4.16	30J5	310	310		0.1%		135	43%	0.1%		135	43%	0.1%		135	44%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W1	350	350		0.1%		68	19%	0.1%		68	19%	0.1%		68	19%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W2	350	350		0.1%		45	13%	0.1%		45	13%	0.1%		45	13%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W3	350	350		0.1%		50	14%	0.1%		50	14%	0.1%		50	14%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W43	365	365		0.1%		248	68%	0.1%		248	68%	0.1%		248	68%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W49	202	250		0.1%		157	78%	0.1%		157	78%	0.1%		158	78%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W50	356	365		0.1%		255	72%	0.1%		256	72%	0.1%		256	72%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W51	365	365		0.1%		171	47%	0.1%		171	47%	0.1%		172	47%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W53	407	540		0.1%		227	56%	0.1%		227	56%	0.1%		228	56%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W60	334	449		0.1%		322	96%	0.1%		322	97%	0.1%		323	97%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W61	343	411		0.1%		332	97%	0.1%		332	97%	0.1%		332	97%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W62	480	480		0.1%		463	96%	0.1%		464	97%	0.1%		464	97%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W63	515	515		0.1%		419	81%	0.1%		419	81%	0.1%		420	82%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W65	345	360		0.1%		337	98%	0.1%		337	98%	0.1%		338	98%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W66	360	360		0.1%		157	44%	0.1%		157	44%	0.1%		158	44%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W80	285	365		0.1%		158	56%	0.1%		158	56%	0.1%		159	56%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W81	368	540		0.1%		343	93%	0.1%		344	93%	0.1%		344	93%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W83	346	540		0.1%		298	86%	0.1%		299	86%	0.1%		299	86%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W84	332	365		0.1%		207	62%	0.1%		207	62%	0.1%		207	62%
Blackstone Valley South	PAWTUCKET #1 STATION	13.8	107W85	305	365		0.1%		261	85%	0.1%		261	86%	0.1%		261	86%
Blackstone Valley South	PAWTUCKET #2 STATION	4.16	148J1	370	370		0.1%		171	46%	0.1%		171	46%	0.1%		171	46%
Blackstone Valley South	PAWTUCKET #2 STATION	4.16	148J3	290	290		0.1%		118	41%	0.1%		118	41%	0.1%		118	41%
Blackstone Valley South	PAWTUCKET #2 STATION	4.16	148J5	370	370		0.1%		215	58%	0.1%		216	58%	0.1%		216	58%
Blackstone Valley South	PAWTUCKET #2 STATION	4.16	148J7	370	370		0.1%		227	61%	0.1%		227	61%	0.1%		228	62%
Blackstone Valley South	SOUTHEAST SUB	4.16	60J1	408	408		0.1%		92	23%	0.1%		92	23%	0.1%		92	23%
Blackstone Valley South	SOUTHEAST SUB	4.16	60J3	408	408		0.1%		124	30%	0.1%		124	30%	0.1%		124	30%
Blackstone Valley South	SOUTHEAST SUB	4.16	60J5	350	350		0.1%		118	34%	0.1%		118	34%	0.1%		118	34%
Blackstone Valley South	VALLEY SUB	13.8	102W41	493	515		0.1%		262	53%	0.1%		262	53%	0.1%		262	53%
Blackstone Valley South	VALLEY SUB	13.8	102W42	463	515		0.1%		427	92%	0.1%		427	92%	0.1%		427	92%
Blackstone Valley South	VALLEY SUB	13.8	102W44	328	460		0.1%		300	92%	0.1%		301	92%	0.1%		301	92%
Blackstone Valley South	VALLEY SUB	13.8	102W50	364	375		0.1%		152	42%	0.1%		152	42%	0.1%		152	42%
Blackstone Valley South	VALLEY SUB	13.8	102W51	341	497		0.1%		317	93%	0.1%		317	93%	0.1%		317	93%
Blackstone Valley South	VALLEY SUB	13.8	102W52	300	365		0.1%		109	36%	0.1%		109	36%	0.1%		109	36%
Blackstone Valley South	VALLEY SUB	13.8	102W54	292	413		0.1%		266	91%	0.1%		266	91%	0.1%		267	91%
Blackstone Valley South	WASHINGTON SUB	13.8	126W40	515	645		0.1%		267	52%	0.1%		267	52%	0.1%		268	52%
Blackstone Valley South	WASHINGTON SUB	13.8	126W41	520	535		0.1%		458	88%	0.1%		458	88%	0.1%		459	88%
Blackstone Valley South	WASHINGTON SUB	13.8	126W42	525	600		0.1%		373	71%	0.1%		373	71%	0.1%		373	71%
Blackstone Valley South	WASHINGTON SUB	13.8	126W50	528	645		0.1%		458	87%	0.1%		459	87%	0.1%		459	87%

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							2026				2027				2028			
Study Area	Substation	Voltage (kV)	Feeder	SN Rating (Amps)	SE Rating (Amps)	Comments	Growth Rate	Spot Loads	Amps	%SN	Growth Rate	Spot Loads	Amps	%SN	Growth Rate	Spot Loads	Amps	%SN
Blackstone Valley South	WASHINGTON SUB	13.8	126W51	515	515		0.1%		490	95%	0.1%		491	95%	0.1%		491	95%
Blackstone Valley South	WASHINGTON SUB	13.8	126W53	583	750		0.1%		24	4%	0.1%		24	4%	0.1%		24	4%
Blackstone Valley South	WASHINGTON SUB	13.8	126W54	530	645		0.1%		505	95%	0.1%		506	95%	0.1%		506	96%
Central RI East	APPONAUG 3	12.47	3F1	510	510		1.7%		536	105%	1.7%		545	107%	1.7%		554	109%
Central RI East	APPONAUG 3	12.47	3F2	515	515		1.7%		517	100%	1.7%		526	102%	1.7%		535	104%
Central RI East	DRUMROCK 14	12.47	14F1	530	612		1.7%		547	103%	1.7%		556	105%	1.7%		565	107%
Central RI East	DRUMROCK 14	12.47	14F2	530	595		1.7%		491	93%	1.7%		499	94%	1.7%		507	96%
Central RI East	DRUMROCK 14	12.47	14F3	515	515		1.7%		403	78%	1.7%		409	79%	1.7%		416	81%
Central RI East	DRUMROCK 14	12.47	14F4	515	515		1.7%		453	88%	1.7%		461	90%	1.7%		468	91%
Central RI East	KILVERT STREET 87	12.47	87F1	530	645		1.7%		552	104%	1.7%		561	106%	1.7%		571	108%
Central RI East	KILVERT STREET 87	12.47	87F2	570	662		1.7%		358	63%	1.7%		364	64%	1.7%		370	65%
Central RI East	KILVERT STREET 87	12.47	87F3	530	645		1.7%		424	80%	1.7%		431	81%	1.7%		438	83%
Central RI East	KILVERT STREET 87	12.47	87F4	530	650		1.7%		439	83%	1.7%		446	84%	1.7%		454	86%
Central RI East	KILVERT STREET 87	12.47	87F5	530	650	Expected In-Service 2015	1.7%		493	93%	1.7%		502	95%	1.7%		510	96%
Central RI East	KILVERT STREET 87	12.47	87F6	530	650	Expected In-Service 2015	1.7%		308	58%	1.7%		314	59%	1.7%		319	60%
Central RI East	LINCOLN AVENUE 72	12.47	72F1	530	650		1.7%		411	78%	1.7%		418	79%	1.7%		425	80%
Central RI East	LINCOLN AVENUE 72	12.47	72F2	530	650		1.7%		531	100%	1.7%		540	102%	1.7%		549	104%
Central RI East	LINCOLN AVENUE 72	12.47	72F3	530	650		1.7%		486	92%	1.7%		494	93%	1.7%		502	95%
Central RI East	LINCOLN AVENUE 72	12.47	72F4	530	650		1.7%		570	108%	1.7%		579	109%	1.7%		589	111%
Central RI East	LINCOLN AVENUE 72	12.47	72F5	515	515		1.7%		549	107%	1.7%		559	109%	1.7%		568	110%
Central RI East	LINCOLN AVENUE 72	12.47	72F6	645	645		1.7%		479	74%	1.7%		487	76%	1.7%		495	77%
Central RI East	PONTIAC 27	12.47	27F1	555	555	Limiting cable element upgraded 2016	1.7%		607	109%	1.7%		617	111%	1.7%		628	113%
Central RI East	PONTIAC 27	12.47	27F2	515	515	Limiting cable element upgraded 2016	1.7%		398	77%	1.7%		405	79%	1.7%		412	80%
Central RI East	PONTIAC 27	12.47	27F3	460	515		1.7%		263	57%	1.7%		267	58%	1.7%		272	59%
Central RI East	PONTIAC 27	12.47	27F4	460	515		1.7%		561	122%	1.7%		571	124%	1.7%		580	126%
Central RI East	PONTIAC 27	12.47	27F5	530	650	Limiting cable element upgraded 2016	1.7%		519	98%	1.7%		527	99%	1.7%		536	101%
Central RI East	PONTIAC 27	12.47	27F6	530	650	Limiting cable element upgraded 2016	1.7%		769	145%	1.7%		782	148%	1.7%		795	150%
Central RI East	WARWICK 52	12.47	52F1	409	476		1.7%		295	72%	1.7%		300	73%	1.7%		305	75%
Central RI East	WARWICK 52	12.47	52F2	476	476		1.7%		300	63%	1.7%		305	64%	1.7%		310	65%
Central RI East	WARWICK 52	12.47	52F3	526	560	Feeder Upgrade in 2014	1.7%		580	110%	1.7%		590	112%	1.7%		600	114%
Central RI West	ANTHONY	12.47	64F1	361	374		1.7%		315	87%	1.7%		320	89%	1.7%		326	90%
Central RI West	ANTHONY	12.47	64F2	361	374		1.7%		290	80%	1.7%		295	82%	1.7%		300	83%
Central RI West	ARCTIC	4.16	49J1	295	352		1.7%		307	104%	1.7%		312	106%	1.7%		318	108%
Central RI West	ARCTIC	4.16	49J2	295	352		1.7%		75	25%	1.7%		76	26%	1.7%		78	26%
Central RI West	ARCTIC	4.16	49J3	295	315		1.7%		303	103%	1.7%		308	104%	1.7%		313	106%
Central RI West	ARCTIC	4.16	49J4	295	352	Planned retire 2015 - New London Ave Related												
Central RI West	COVENTRY	12.47	54F1	526	560		1.7%		447	85%	1.7%		454	86%	1.7%		462	88%
Central RI West	DIVISION ST	12.47	61F1	450	476		1.7%		507	113%	1.7%		516	115%	1.7%		524	117%
Central RI West	DIVISION ST	12.47	61F2	450	476		1.7%		495	110%	1.7%		503	112%	1.7%		512	114%
Central RI West	DIVISION ST	12.47	61F3	450	476		1.7%		461	103%	1.7%		469	104%	1.7%		477	106%
Central RI West	DIVISION ST	12.47	61F4	450	645		1.7%		511	114%	1.7%		520	116%	1.7%		529	118%
Central RI West	HOPE	12.47	15F1	348	394		1.7%		334	96%	1.7%		340	98%	1.7%		345	99%
Central RI West	HOPE	12.47	15F2	476	476		1.7%		556	117%	1.7%		565	119%	1.7%		575	121%
Central RI West	HOPKINS HILL	12.47	63F1	538	650		1.7%		347	64%	1.7%		353	66%	1.7%		359	67%
Central RI West	HOPKINS HILL	12.47	63F2	530	650		1.7%		608	115%	1.7%		618	117%	1.7%		629	119%
Central RI West	HOPKINS HILL	12.47	63F3	530	650		1.7%		466	88%	1.7%		474	89%	1.7%		482	91%
Central RI West	HOPKINS HILL	12.47	63F4	530	650		1.7%		544	103%	1.7%		553	104%	1.7%		562	106%
Central RI West	HOPKINS HILL	12.47	63F5	530	650		1.7%		471	89%	1.7%		479	90%	1.7%		488	92%
Central RI West	HOPKINS HILL	12.47	63F6	530	650		1.7%		641	121%	1.7%		651	123%	1.7%		663	125%
Central RI West	HUNT RIVER	12.47	40F1	274	327	Planned retire 2017 - Flood Mitigation												
Central RI West	KENT COUNTY	12.47	22F1	530	650		1.7%		605	114%	1.7%		616	116%	1.7%		626	118%
Central RI West	KENT COUNTY	12.47	22F2	530	650		1.7%		610	115%	1.7%		620	117%	1.7%		631	119%
Central RI West	KENT COUNTY	12.47	22F3	530	650		1.7%		424	80%	1.7%		431	81%	1.7%		438	83%
Central RI West	KENT COUNTY	12.47	22F4	586	662		1.7%		469	80%	1.7%		477	81%	1.7%		485	83%
Central RI West	KENT COUNTY	12.47	22F6	530	650	Expected In-Service 2017	1.7%		518	98%	1.7%		527	99%	1.7%		536	101%
Central RI West	NATICK	12.47	29F1	526	560		1.7%		485	92%	1.7%		493	94%	1.7%		502	95%
Central RI West	NATICK	12.47	29F2	408	408		1.7%		476	117%	1.7%		484	119%	1.7%		492	121%
Central RI West	TIOGUE AVE	12.47	100F1	570	612	In-Service 2013	1.7%		562	99%	1.7%		572	100%	1.7%		581	102%
Central RI West	WARWICK MALL	12.47	28F1	390	412		1.7%		235	60%	1.7%		239	61%	1.7%		243	62%
Central RI West	WARWICK MALL	12.47	28F2	390	422		1.7%		176	45%	1.7%		179	46%	1.7%		182	47%
Central RI West	NEW LONDON AVE	12.47	150F1	645	645	Expected In-Service 2015	1.7%		432	67%	1.7%		439	68%	1.7%		447	69%
Central RI West	NEW LONDON AVE	12.47	150F3	530	650	Expected In-Service 2015	1.7%		358	68%	1.7%		364	69%	1.7%		370	70%
Central RI West	NEW LONDON AVE	12.47	150F5	530	650	Expected In-Service 2015	1.7%		401	76%	1.7%		408	77%	1.7%		415	78%
Central RI West	NEW LONDON AVE	12.47	150F7	645	645	Expected In-Service 2015	1.7%		308	48%	1.7%		314	49%	1.7%		319	49%
East Bay	BARRINGTON 4	12.47	4F1	515	515		0.1%		495	96%	0.1%		495	96%	0.1%		496	96%
East Bay	BARRINGTON 4	12.47	4F2	510	510		0.1%		476	93%	0.1%		476	93%	0.1%		477	94%
East Bay	BRISTOL 51A	12.47	51F1	502	612		0.1%		476	95%	0.1%		476	95%	0.1%		477	95%
East Bay	BRISTOL 51A	12.47	51F2	530	612		0.1%		468	88%	0.1%		468	88%	0.1%		469	88%
East Bay	BRISTOL 51A	12.47	51F3	502	612		0.1%		446	89%	0.1%		447	89%	0.1%		447	89%
East Bay	KENT CORNERS 47	4.16	47J1	285	313		0.1%		38	13%	0.1%		38	13%	0.1%		38	13%
East Bay	KENT CORNERS 47	4.16	47J2	379	408		0.1%		327	86%	0.1%		327	86%	0.1%		328	86%
East Bay	KENT CORNERS 47	4.16	47J3	379	408	Upgrade limiting element (regualtors) 2013	0.1%		362	95%	0.1%		362	96%	0.1%		363	96%
East Bay	KENT CORNERS 47	4.16	47J4	379	408		0.1%		323	85%	0.1%		323	85%	0.1%		323	85%
East Bay	PHILLIPSDALE 20	12.47	20F1	425	450		0.1%		282	66%	0.1%		283	66%	0.1%		283	67%
East Bay	PHILLIPSDALE 20	12.47	20F2	425	450		0.1%		337	79%	0.1%		337	79%	0.1%		338	79%
East Bay	WAMPANOAG 48	12.47	48F1	502	507		0.1%		490	98%	0.1%		491	98%	0.1%		491	98%
East Bay	WAMPANOAG 48	12.47	48F2	515	515		0.1%		405	79%	0.1%		406	79%	0.1%		406	79%
East Bay	WAMPANOAG 48	12.47	48F3	510	515		0.1%		501	98%	0.1%		501	98%	0.1%		502	98%
East Bay	WAMPANOAG 48	12.47	48F4	530	612		0.1%		503	95%	0.1%		503	95%	0.1%		504	95%
East Bay	WAMPANOAG 48	12.47	48F5	485	490		0.1%		450	93%	0.1%		450	93%	0.1%		451	93%
East Bay	WAMPANOAG 48	12.47	48F6	530	612		0.1%		459	87%	0.1%		459	87%	0.1%		460	87%
East Bay	WARREN 5	12.47	5F1	425	520		0.1%		337	79%	0.1%		337	79%	0.1%		337	79%
East Bay	WARREN 5	12.47	5F2	434	434		0.1%		439	101%	0.1%		439	101%	0.1%		440	101%

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							2026				2027				2028			
Study Area	Substation	Voltage (kV)	Feeder	SN Rating (Amps)	SE Rating (Amps)	Comments	Growth Rate	Spot Loads	Amps	%SN	Growth Rate	Spot Loads	Amps	%SN	Growth Rate	Spot Loads	Amps	%SN
East Bay	WARREN 5	12.47	5F3	515	515		0.1%		386	75%	0.1%		387	75%	0.1%		387	75%
East Bay	WARREN 5	12.47	5F4	510	510		0.1%		468	92%	0.1%		469	92%	0.1%		469	92%
East Bay	WATERMAN AVENUE 78	12.47	78F3	409	489		0.1%		355	87%	0.1%		356	87%	0.1%		356	87%
East Bay	WATERMAN AVENUE 78	12.47	78F4	409	489		0.1%		297	73%	0.1%		297	73%	0.1%		297	73%
Newport	BAILEY BROOK	4.16	19J14	476	476	Planned retire 2015 (Newport related)												
Newport	BAILEY BROOK	4.16	19J16	476	476	Planned retire 2015 (Newport related)												
Newport	BAILEY BROOK	4.16	19J2	447	476	Planned retire 2015 (Newport related)												
Newport	CLARKE STREET	4.16	65J12	575	575	Planned Upgrade 2015	1.5%		484	84%	1.5%		491	85%	1.5%		498	87%
Newport	CLARKE STREET	4.16	65J2	570	595		1.5%		557	98%	1.5%		565	99%	1.5%		574	101%
Newport	DEXTER	13.8	36W41	464	566		1.5%		451	97%	1.5%		458	99%	1.5%		465	100%
Newport	DEXTER	13.8	36W42	464	515		1.5%		289	62%	1.5%		293	63%	1.5%		298	64%
Newport	DEXTER	13.8	36W43	464	566		1.5%		208	45%	1.5%		211	45%	1.5%		214	46%
Newport	DEXTER	13.8	36W44	464	566		1.5%		387	83%	1.5%		393	85%	1.5%		399	86%
Newport	ELDRED	4.16	45J2	448	476	Planned retire 2015												
Newport	ELDRED	4.16	45J4	340	340	Planned retire 2015												
Newport	ELDRED	4.16	45J6	448	476	Planned retire 2015												
Newport	ELDRED NEW	4.16	45J1	530	600	Expected in-service 2015	1.5%		480	90%	1.5%		487	92%	1.5%		494	93%
Newport	ELDRED NEW	4.16	45J2	530	600	Expected in-service 2015	1.5%		369	70%	1.5%		375	71%	1.5%		380	72%
Newport	GATE II	4.16	38J2	440	476	Planned retire 2015 (Newport related)												
Newport	GATE II	4.16	38J4	440	476	Planned retire 2015 (Newport related)												
Newport	HARRISON	4.16	32J12	530	540		1.5%		449	85%	1.5%		455	86%	1.5%		462	87%
Newport	HARRISON	4.16	32J14	366	500		1.5%		402	110%	1.5%		408	112%	1.5%		415	113%
Newport	HARRISON	4.16	32J2	350	420		1.5%		310	89%	1.5%		315	90%	1.5%		319	91%
Newport	HARRISON	4.16	32J4	300	380		1.5%		168	56%	1.5%		171	57%	1.5%		173	58%
Newport	HOSPITAL	4.16	146J12	434	434		1.5%		192	44%	1.5%		195	45%	1.5%		198	46%
Newport	HOSPITAL	4.16	146J14	307	365		1.5%		168	55%	1.5%		171	56%	1.5%		173	56%
Newport	HOSPITAL	4.16	146J2	300	357		1.5%		173	58%	1.5%		175	58%	1.5%		178	59%
Newport	HOSPITAL	4.16	146J4	434	434		1.5%		273	63%	1.5%		278	64%	1.5%		282	65%
Newport	JEPSON	4.16	37J2	380	380	Planned retire 2015 (Newport related)												
Newport	JEPSON	4.16	37J4	380	380	Planned retire 2015 (Newport related)												
Newport	JEPSON	13.8	37W41	560	560		1.5%		253	45%	1.5%		257	46%	1.5%		261	47%
Newport	JEPSON	13.8	37W42	560	560		1.5%		456	81%	1.5%		463	83%	1.5%		470	84%
Newport	JEPSON	13.8	37W43	560	560		1.5%		419	75%	1.5%		425	76%	1.5%		432	77%
Newport	KINGSTON	4.16	131J12	380	380		1.5%		362	95%	1.5%		367	97%	1.5%		373	98%
Newport	KINGSTON	4.16	131J14	307	365		1.5%		311	101%	1.5%		316	103%	1.5%		321	104%
Newport	KINGSTON	4.16	131J2	397	510		1.5%		408	103%	1.5%		414	104%	1.5%		420	106%
Newport	KINGSTON	4.16	131J4	510	510		1.5%		366	72%	1.5%		372	73%	1.5%		377	74%
Newport	KINGSTON	4.16	131J6	380	380		1.5%		64	17%	1.5%		65	17%	1.5%		66	17%
Newport	MERTON	4.16	51J12	356	408		1.5%		168	47%	1.5%		171	48%	1.5%		173	49%
Newport	MERTON	4.16	51J14	310	368		1.5%		179	58%	1.5%		182	59%	1.5%		185	60%
Newport	MERTON	4.16	51J16	380	380		1.5%		337	89%	1.5%		342	90%	1.5%		347	91%
Newport	MERTON	4.16	51J2	310	333		1.5%		328	106%	1.5%		333	107%	1.5%		338	109%
Newport	NEWPORT SUB	13.8	W1	530	600	Expected in-service 2015	1.5%		317	60%	1.5%		321	61%	1.5%		326	62%
Newport	NEWPORT SUB	13.8	W2	530	600	Expected in-service 2015	1.5%		362	68%	1.5%		368	69%	1.5%		373	70%
Newport	NEWPORT SUB	13.8	W3	530	600	Expected in-service 2015	1.5%		343	65%	1.5%		348	66%	1.5%		353	67%
Newport	NEWPORT SUB	13.8	W4	530	600	Expected in-service 2015	1.5%		488	92%	1.5%		495	93%	1.5%		503	95%
Newport	NEWPORT SUB	13.8	W5	530	600	Expected in-service 2015	1.5%		249	47%	1.5%		253	48%	1.5%		257	48%
Newport	NO. AQUIDNECK	4.16	21J2	480	480		1.5%		212	44%	1.5%		215	45%	1.5%		218	45%
Newport	NO. AQUIDNECK	4.16	21J4	480	480		1.5%		399	83%	1.5%		405	84%	1.5%		411	86%
Newport	NO. AQUIDNECK	4.16	21J6	480	480	Planned retire 2015 (Newport related)												
Newport	SO. AQUIDNECK	4.16	122J2	481	510		1.5%		505	105%	1.5%		512	107%	1.5%		520	108%
Newport	SO. AQUIDNECK	4.16	122J4	480	510		1.5%		273	57%	1.5%		277	58%	1.5%		281	58%
Newport	SO. AQUIDNECK	4.16	122J6	480	480	Planned retire 2015 (Newport related)												
Newport	VERNON	4.16	23J12	384	408	Planned retire 2015 (Newport related)												
Newport	VERNON	4.16	23J14	384	408	Planned retire 2015 (Newport related)												
Newport	VERNON	4.16	23J2	384	408	Planned retire 2015 (Newport related)												
Newport	VERNON	4.16	23J4	384	408	Planned retire 2015 (Newport related)												
Newport	VERNON	4.16	23J6	384	408	Planned retire 2015 (Newport related)												
Newport	WEST HOWARD	4.16	154J14	290	350		1.5%		289	100%	1.5%		294	101%	1.5%		298	103%
Newport	WEST HOWARD	4.16	154J16	270	340		1.5%		287	106%	1.5%		291	108%	1.5%		295	109%
Newport	WEST HOWARD	4.16	154J18	380	380		1.5%		404	106%	1.5%		410	108%	1.5%		416	109%
Newport	WEST HOWARD	4.16	154J2	480	688		1.5%		411	86%	1.5%		417	87%	1.5%		423	88%
Newport	WEST HOWARD	4.16	154J4	290	350		1.5%		295	102%	1.5%		300	103%	1.5%		304	105%
Newport	WEST HOWARD	4.16	154J6	268	346		1.5%		277	103%	1.5%		281	105%	1.5%		286	107%
Newport	WEST HOWARD	4.16	154J8	380	380		1.5%		387	102%	1.5%		393	103%	1.5%		399	105%
North Central RI	CENTREDALE 50	12.47	50F2	367	386		1.8%		308	84%	1.8%		313	85%	1.8%		319	87%
North Central RI	CENTREDALE 50	4.16	50J1	285	313		2.4%		230	81%	2.4%		236	83%	2.4%		241	85%
North Central RI	CENTREDALE 50	4.16	50J2	295	352		2.4%		0	0%	2.4%		0	0%	2.4%		0	0%
North Central RI	CENTREDALE 50	4.16	50J3	408	408		2.4%		345	85%	2.4%		354	87%	2.4%		362	89%
North Central RI	CHOPMIST 34	12.47	34F1	530	544		1.8%		529	100%	1.8%		538	102%	1.8%		548	103%
North Central RI	CHOPMIST 34	12.47	34F2	415	415		1.8%		429	103%	1.8%		436	105%	1.8%		444	107%
North Central RI	CHOPMIST 34	12.47	34F3	385	385		1.8%		380	99%	1.8%		387	101%	1.8%		394	102%
North Central RI	FARNUM PIKE 23	12.47	23F1	530	650		1.8%		486	92%	1.8%		495	93%	1.8%		504	95%
North Central RI	FARNUM PIKE 23	12.47	23F2	515	515		1.8%		548	106%	1.8%		558	108%	1.8%		568	110%
North Central RI	FARNUM PIKE 23	12.47	23F3	530	640		1.8%		428	81%	1.8%		436	82%	1.8%		444	84%
North Central RI	FARNUM PIKE 23	12.47	23F4	530	612		1.8%		395	75%	1.8%		402	76%	1.8%		409	77%
North Central RI	FARNUM PIKE 23	12.47	23F5	515	515		1.8%		168	33%	1.8%		171	33%	1.8%		174	34%
North Central RI	FARNUM PIKE 23	12.47	23F6	515	515		1.8%		538	104%	1.8%		548	106%	1.8%		557	108%
North Central RI	JOHNSTON 18	12.47	18F1	526	626		1.8%		508	96%	1.8%		517	98%	1.8%		526	100%
North Central RI	JOHNSTON 18	12.47	18F10	530	612	Expected in-service 2013	1.8%		415	78%	1.8%		422	80%	1.8%		430	81%
North Central RI	JOHNSTON 18	12.47	18F2	452	515		1.8%		460	102%	1.8%		468	104%	1.8%		476	105%
North Central RI	JOHNSTON 18	12.47	18F3	515	515		1.8%		447	87%	1.8%		455	88%	1.8%		463	90%
North Central RI	JOHNSTON 18	12.47	18F4	530	560		1.8%		365	69%	1.8%		372	70%	1.8%		379	71%

Feeders - Normal Configuration Summary
2012 Annual Planning
Rhode Island Study Areas

							2026				2027				2028			
Study Area	Substation	Voltage (kV)	Feeder	SN Rating (Amps)	SE Rating (Amps)	Comments	Growth Rate	Spot Loads	Amps	%SN	Growth Rate	Spot Loads	Amps	%SN	Growth Rate	Spot Loads	Amps	%SN
North Central RI	JOHNSTON 18	12.47	18F5	530	612		1.8%		499	94%	1.8%		508	96%	1.8%		517	98%
North Central RI	JOHNSTON 18	12.47	18F6	515	515		1.8%		387	75%	1.8%		394	76%	1.8%		401	78%
North Central RI	JOHNSTON 18	12.47	18F7	530	612		1.8%		475	90%	1.8%		483	91%	1.8%		492	93%
North Central RI	JOHNSTON 18	12.47	18F8	530	612		1.8%		391	74%	1.8%		398	75%	1.8%		405	77%
North Central RI	JOHNSTON 18	12.47	18F9	530	612		1.8%		579	109%	1.8%		589	111%	1.8%		600	113%
North Central RI	MANTON 69	12.47	69F1	515	515		1.8%		508	99%	1.8%		517	100%	1.8%		526	102%
North Central RI	MANTON 69	12.47	69F3	502	515		1.8%		486	97%	1.8%		494	98%	1.8%		503	100%
North Central RI	PUTNAM PIKE 38	12.47	38F1	530	650		1.8%		538	102%	1.8%		548	103%	1.8%		558	105%
North Central RI	PUTNAM PIKE 38	12.47	38F2	530	650		1.8%		431	81%	1.8%		439	83%	1.8%		447	84%
North Central RI	PUTNAM PIKE 38	12.47	38F3	530	650		1.8%		492	93%	1.8%		501	95%	1.8%		510	96%
North Central RI	PUTNAM PIKE 38	12.47	38F4	515	515		1.8%		343	67%	1.8%		349	68%	1.8%		356	69%
North Central RI	PUTNAM PIKE 38	12.47	38F5	530	612		1.8%		503	95%	1.8%		512	97%	1.8%		522	98%
North Central RI	PUTNAM PIKE 38	12.47	38F6	530	612		1.8%		519	98%	1.8%		528	100%	1.8%		537	101%
North Central RI	SHUNPIKE SIMS	13.2	35F8	700	765	Expected in-service 2014	2.4%		625	89%	2.4%		640	91%	2.4%		655	94%
North Central RI	SHUNPIKE 35	12.47	35F1	543	727	Expected in-service 2018	2.4%		238	44%	2.4%		243	45%	2.4%		249	46%
North Central RI	SHUNPIKE 35	12.47	35F2	538	698	Expected in-service 2018	2.4%		229	43%	2.4%		235	44%	2.4%		241	45%
North Central RI	SHUNPIKE 35	12.47	35F3	510	694	Expected in-service 2018	2.4%		195	38%	2.4%		200	39%	2.4%		204	40%
North Central RI	WEST CRANSTON 21	12.47	21F1	515	515		1.8%		480	93%	1.8%		489	95%	1.8%		497	97%
North Central RI	WEST CRANSTON 21	12.47	21F2	515	515		1.8%		578	112%	1.8%		588	114%	1.8%		599	116%
North Central RI	WEST CRANSTON 21	12.47	21F4	515	515		1.8%		541	105%	1.8%		550	107%	1.8%		560	109%
North Central RI	WEST GREENVILLE 45	12.47	45F2	425	520		1.8%		165	39%	1.8%		168	40%	1.8%		171	40%
Providence	ADMIRAL STREET 9	11.5	1115	250	250		0.1%		55		0.1%		55		0.1%		55	
Providence	ADMIRAL STREET 9	11.5	1117	250	250		0.1%		175		0.1%		175		0.1%		175	
Providence	ADMIRAL STREET 9	11.5	1119	250	250		0.1%		84		0.1%		84		0.1%		84	
Providence	ADMIRAL STREET 9	4.16	9J1	297	326		0.1%		295	99%	0.1%		295	99%	0.1%		295	99%
Providence	ADMIRAL STREET 9	4.16	9J2	369	441		0.1%		175	47%	0.1%		175	47%	0.1%		175	47%
Providence	ADMIRAL STREET 9	4.16	9J3	255	255		0.1%		212	83%	0.1%		212	83%	0.1%		213	83%
Providence	ADMIRAL STREET 9	4.16	9J5	297	326		0.1%		167	56%	0.1%		167	56%	0.1%		167	56%
Providence	CLARKSON STREET 13	12.47	13F1	400	533		0.1%		321	80%	0.1%		321	80%	0.1%		322	80%
Providence	CLARKSON STREET 13	12.47	13F10	400	533	Expeted in-service 2013	0.1%		256	64%	0.1%		256	64%	0.1%		257	64%
Providence	CLARKSON STREET 13	12.47	13F2	540	612		0.1%		491	91%	0.1%		491	91%	0.1%		492	91%
Providence	CLARKSON STREET 13	12.47	13F3	425	612		0.1%		414	97%	0.1%		415	98%	0.1%		415	98%
Providence	CLARKSON STREET 13	12.47	13F4	520	612		0.1%		517	99%	0.1%		518	100%	0.1%		518	100%
Providence	CLARKSON STREET 13	12.47	13F5	455	612		0.1%		365	80%	0.1%		366	80%	0.1%		366	80%
Providence	CLARKSON STREET 13	12.47	13F6	415	542		0.1%		231	56%	0.1%		232	56%	0.1%		232	56%
Providence	CLARKSON STREET 13	12.47	13F7	436	571		0.1%		274	63%	0.1%		274	63%	0.1%		274	63%
Providence	CLARKSON STREET 13	12.47	13F8	437	563		0.1%		304	69%	0.1%		304	70%	0.1%		304	70%
Providence	CLARKSON STREET 13	12.47	13F9	530	612		0.1%		506	95%	0.1%		506	96%	0.1%		507	96%
Providence	DYER STREET 2	11.5	1103	250	250		0.1%		181		0.1%		181		0.1%		182	
Providence	DYER STREET 2	4.16	2J1	408	408		0.1%		371	91%	0.1%		371	91%	0.1%		372	91%
Providence	DYER STREET 2	4.16	2J10	354	354		0.1%		207	59%	0.1%		208	59%	0.1%		208	59%
Providence	DYER STREET 2	4.16	2J2	285	313		0.1%		153	54%	0.1%		153	54%	0.1%		153	54%
Providence	DYER STREET 2	4.16	2J3	297	326		0.1%		87	29%	0.1%		87	29%	0.1%		87	29%
Providence	DYER STREET 2	4.16	2J4	340	340		0.1%		189	56%	0.1%		189	56%	0.1%		189	56%
Providence	DYER STREET 2	4.16	2J5	354	354		0.1%		140	39%	0.1%		140	39%	0.1%		140	40%
Providence	DYER STREET 2	4.16	2J7	354	354		0.1%		251	71%	0.1%		251	71%	0.1%		251	71%
Providence	DYER STREET 2	4.16	2J8	354	354		0.1%		207	59%	0.1%		208	59%	0.1%		208	59%
Providence	DYER STREET 2	4.16	2J9	340	340		0.1%		291	86%	0.1%		291	86%	0.1%		292	86%
Providence	EAST GEORGE ST 77	4.16	77J1	371	408		0.1%		287	77%	0.1%		288	78%	0.1%		288	78%
Providence	EAST GEORGE ST 77	4.16	77J2	364	495		0.1%		347	95%	0.1%		347	95%	0.1%		348	96%
Providence	EAST GEORGE ST 77	4.16	77J3	371	385		0.1%		335	90%	0.1%		335	90%	0.1%		335	90%
Providence	EAST GEORGE ST 77	4.16	77J4	364	495		0.1%		327	90%	0.1%		328	90%	0.1%		328	90%
Providence	ELMWOOD 7 - OUTDOOR	12.47	7F1	530	612		0.1%		419	79%	0.1%		419	79%	0.1%		420	79%
Providence	ELMWOOD 7 - OUTDOOR	12.47	7F2	530	612		0.1%		507	96%	0.1%		508	96%	0.1%		508	96%
Providence	ELMWOOD 7 - OUTDOOR	12.47	7F4	530	612		0.1%		495	93%	0.1%		496	94%	0.1%		496	94%
Providence	FRANKLIN SQUARE 11	11.5	1112	280	280		0.1%		69	25%	0.1%		69	25%	0.1%		69	25%
Providence	FRANKLIN SQUARE 11	11.5	1121	363	455		0.1%		97	27%	0.1%		97	27%	0.1%		97	27%
Providence	FRANKLIN SQUARE 11	11.5	1123	404	404		0.1%		52	13%	0.1%		52	13%	0.1%		52	13%
Providence	FRANKLIN SQUARE 11	11.5	1125	696	834		0.1%		214	31%	0.1%		214	31%	0.1%		215	31%
Providence	FRANKLIN SQUARE 11	11.5	1126	327	450		0.1%		237	73%	0.1%		237	73%	0.1%		238	73%
Providence	FRANKLIN SQUARE 11	11.5	1149	250	250		0.1%		63	25%	0.1%		63	25%	0.1%		63	25%
Providence	FRANKLIN SQUARE 11	11.5	1153	313	350		0.1%		179	57%	0.1%		179	57%	0.1%		179	57%
Providence	GENEVA 71	4.16	71J1	285	313		0.1%		249	87%	0.1%		249	87%	0.1%		249	87%
Providence	GENEVA 71	4.16	71J2	379	408		0.1%		163	43%	0.1%		163	43%	0.1%		163	43%
Providence	GENEVA 71	4.16	71J3	379	408		0.1%		205	54%	0.1%		205	54%	0.1%		206	54%
Providence	GENEVA 71	4.16	71J4	342	408		0.1%		231	68%	0.1%		232	68%	0.1%		232	68%
Providence	GENEVA 71	4.16	71J5	342	408		0.1%		340	100%	0.1%		341	100%	0.1%		341	100%
Providence	HARRIS AVENUE 12	11.5	1131	250	250		0.1%		78	31%	0.1%		78	31%	0.1%		78	31%
Providence	HARRIS AVENUE 12	4.16	12J1	285	313		0.1%		73	26%	0.1%		73	26%	0.1%		73	26%
Providence	HARRIS AVENUE 12	4.16	12J2	379	416		0.1%		284	75%	0.1%		284	75%	0.1%		284	75%
Providence	HARRIS AVENUE 12	4.16	12J3	285	313		0.1%		164	57%	0.1%		164	57%	0.1%		164	58%
Providence	HARRIS AVENUE 12	4.16	12J4	297	326		0.1%		298	100%	0.1%		299	101%	0.1%		299	101%
Providence	HARRIS AVENUE 12	4.16	12J5	297	326		0.1%		109	37%	0.1%		109	37%	0.1%		109	37%
Providence	HARRIS AVENUE 12	4.16	12J6	297	326		0.1%		164	55%	0.1%		164	55%	0.1%		164	55%
Providence	HUNTINGTON PARK 67	4.16	67J1	354	423		0.1%		279	79%	0.1%		279	79%	0.1%		280	79%
Providence	KNIGHTSVILLE 66	4.16	66J1	315	405		0.1%		253	80%	0.1%		253	80%	0.1%		254	81%
Providence	KNIGHTSVILLE 66	4.16	66J2	379	408		0.1%		358	94%	0.1%		358	95%	0.1%		359	95%
Providence	KNIGHTSVILLE 66	4.16	66J3	379	408		0.1%		380	100%	0.1%		380	100%	0.1%		380	100%
Providence	KNIGHTSVILLE 66	4.16	66J4	379	408		0.1%		284	75%	0.1%		284	75%	0.1%		284	75%
Providence	KNIGHTSVILLE 66	4.16	66J5	379	408		0.1%		301	79%	0.1%		301	80%	0.1%		302	80%
Providence	LIPPITT HILL 79	12.47	79F1	459	579		0.1%		360	78%	0.1%		360	79%	0.1%		361	79%
Providence	LIPPITT HILL 79	12.47	79F2	459	579		0.1%		418	91%	0.1%		418	91%	0.1%		419	91%
Providence	OLNEYVILLE 6	4.16	6J1	306	354		0.1%		205	67%	0.1%		205	67%	0.1%		206	67%

Feeders - Normal Configuration Summary
2012 Annual Planning
Rhode Island Study Areas

							2026				2027				2028			
Study Area	Substation	Voltage (kV)	Feeder	SN Rating (Amps)	SE Rating (Amps)	Comments	Growth Rate	Spot Loads	Amps	%SN	Growth Rate	Spot Loads	Amps	%SN	Growth Rate	Spot Loads	Amps	%SN
Providence	OLNEYVILLE 6	4.16	6J2	306	354		0.1%		239	78%	0.1%		239	78%	0.1%		239	78%
Providence	OLNEYVILLE 6	4.16	6J3	306	354		0.1%		128	42%	0.1%		128	42%	0.1%		128	42%
Providence	OLNEYVILLE 6	4.16	6J5	306	354		0.1%		118	39%	0.1%		118	39%	0.1%		118	39%
Providence	OLNEYVILLE 6	4.16	6J6	306	354		0.1%		151	49%	0.1%		151	49%	0.1%		151	49%
Providence	OLNEYVILLE 6	4.16	6J7	306	354		0.1%		231	76%	0.1%		232	76%	0.1%		232	76%
Providence	OLNEYVILLE 6	4.16	6J8	306	354		0.1%		71	23%	0.1%		71	23%	0.1%		71	23%
Providence	POINT STREET 76	12.47	76F1	484	490		0.1%		456	94%	0.1%		457	94%	0.1%		457	94%
Providence	POINT STREET 76	12.47	76F2	500	612		0.1%		459	92%	0.1%		459	92%	0.1%		460	92%
Providence	POINT STREET 76	12.47	76F3	546	653		0.1%		253	46%	0.1%		253	46%	0.1%		253	46%
Providence	POINT STREET 76	12.47	76F4	530	612		0.1%		539	102%	0.1%		540	102%	0.1%		540	102%
Providence	POINT STREET 76	12.47	76F5	448	570		0.1%		452	101%	0.1%		453	101%	0.1%		453	101%
Providence	POINT STREET 76	12.47	76F6	518	612		0.1%		520	100%	0.1%		521	101%	0.1%		522	101%
Providence	POINT STREET 76	12.47	76F7	525	612		0.1%		498	95%	0.1%		498	95%	0.1%		499	95%
Providence	POINT STREET 76	12.47	76F8	530	612		0.1%		260	49%	0.1%		260	49%	0.1%		260	49%
Providence	ROCHAMBEAU AVENUE 37	4.16	37J1	329	408		0.1%		262	80%	0.1%		262	80%	0.1%		262	80%
Providence	ROCHAMBEAU AVENUE 37	4.16	37J2	291	349		0.1%		269	92%	0.1%		269	93%	0.1%		270	93%
Providence	ROCHAMBEAU AVENUE 37	4.16	37J3	303	408		0.1%		267	88%	0.1%		268	88%	0.1%		268	88%
Providence	ROCHAMBEAU AVENUE 37	4.16	37J4	278	371		0.1%		259	93%	0.1%		259	93%	0.1%		259	93%
Providence	ROCHAMBEAU AVENUE 37	4.16	37J5	347	408		0.1%		253	73%	0.1%		253	73%	0.1%		254	73%
Providence	SOUTH STREET 1	11.5	1101	250	250		0.1%		239		0.1%		239		0.1%		239	
Providence	SOUTH STREET 1	11.5	1151	322	375		0.1%		251	78%	0.1%		251	78%	0.1%		251	78%
Providence	SPRAGUE STREET 36	4.16	36J1	236	283		0.1%		196	83%	0.1%		197	83%	0.1%		197	83%
Providence	SPRAGUE STREET 36	4.16	36J2	252	299		0.1%		195	77%	0.1%		195	77%	0.1%		195	77%
Providence	SPRAGUE STREET 36	4.16	36J4	344	405		0.1%		258	75%	0.1%		258	75%	0.1%		259	75%
Providence	SPRAGUE STREET 36	4.16	36J5	315	315		0.1%		193	61%	0.1%		193	61%	0.1%		193	61%
South County East	BONNET 42	12.47	42F1	525	566		1.7%		629	120%	1.7%		640	122%	1.7%		650	124%
South County East	LAFAYETTE 30	12.47	30F1	350	385		1.7%		332	95%	1.7%		338	97%	1.7%		344	98%
South County East	LAFAYETTE 30	12.47	30F2	546	578		1.7%		573	105%	1.7%		583	107%	1.7%		592	109%
South County East	OLD BAPTIST ROAD 46	12.47	46F1	530	612		1.7%		582	110%	1.7%		592	112%	1.7%		602	114%
South County East	OLD BAPTIST ROAD 46	12.47	46F2	530	612		1.7%		585	110%	1.7%		595	112%	1.7%		605	114%
South County East	OLD BAPTIST ROAD 46	12.47	46F3	565	612		1.7%		617	109%	1.7%		628	111%	1.7%		638	113%
South County East	OLD BAPTIST ROAD 46	12.47	46F4	594	612		1.7%		640	108%	1.7%		650	109%	1.7%		661	111%
South County East	PEACEDALE 59	12.47	59F1	409	476		1.7%		213	52%	1.7%		217	53%	1.7%		220	54%
South County East	PEACEDALE 59	12.47	59F2	515	515		1.7%		428	83%	1.7%		435	84%	1.7%		442	86%
South County East	PEACEDALE 59	12.47	59F3	521	578		1.7%		598	115%	1.7%		608	117%	1.7%		618	119%
South County East	PEACEDALE 59	12.47	59F4	409	489		1.7%		226	55%	1.7%		230	56%	1.7%		234	57%
South County East	QUONSET 83	12.47	83F1	560	645		1.7%		182	33%	1.7%		185	33%	1.7%		188	34%
South County East	QUONSET 83	12.47	83F2	530	650		1.7%		543	102%	1.7%		552	104%	1.7%		561	106%
South County East	QUONSET 83	12.47	83F3	560	645		1.7%		278	50%	1.7%		282	50%	1.7%		287	51%
South County East	TOWER HILL 88	12.47	88F1	530	650		1.7%		527	100%	1.7%		536	101%	1.7%		546	103%
South County East	TOWER HILL 88	12.47	88F3	548	645		1.7%		641	117%	1.7%		651	119%	1.7%		663	121%
South County East	TOWER HILL 88	12.47	88F5	530	650		1.7%		493	93%	1.7%		501	95%	1.7%		509	96%
South County East	TOWER HILL 88	12.47	88F7	530	650	Expected in-service 2014	1.7%		515	97%	1.7%		524	99%	1.7%		533	101%
South County East	WAKEFIELD 17	12.47	17F1	602	645	Feeder Upgrade in 2014	1.7%		677	113%	1.7%		689	114%	1.7%		701	116%
South County East	WAKEFIELD 17	12.47	17F2	510	510		1.7%		525	103%	1.7%		533	105%	1.7%		543	106%
South County East	WAKEFIELD 17	12.47	17F3	597	626		1.7%		627	105%	1.7%		638	107%	1.7%		649	109%
South County West	ASHAWAY 43	12.47	43F1	388	423	Planned retire 2014 (Hopkinton related)												
South County West	HOPE VALLEY 41	12.47	41F1	347	430	Planned retire 2014 (Hopkinton related)												
South County West	HOPKINTON	12.47	F1	515	515	Expected in-service 2014	1.7%		394	77%	1.7%		401	78%	1.7%	0	408	79%
South County West	HOPKINTON	12.47	F2	645	645	Expected in-service 2014	1.7%		432	67%	1.7%		440	68%	1.7%	0	447	69%
South County West	HOPKINTON	12.47	F3	530	650	Expected in-service 2014	1.7%		560	106%	1.7%		569	107%	1.7%	0	579	109%
South County West	HOPKINTON	12.47	F4	645	645	Expected in-service 2014	1.7%		610	95%	1.7%		621	96%	1.7%	0	631	98%
South County West	HOPKINTON	12.47	F5	530	650	Expected in-service 2014	1.7%		521	98%	1.7%		530	100%	1.7%	0	539	102%
South County West	HOPKINTON	12.47	F6	645	645	Expected in-service 2014	1.7%		547	85%	1.7%		556	86%	1.7%	0	566	88%
South County West	HOPKINTON	13.47	F7	315	315	Expected in-service 2014	1.7%		356	113%	1.7%		362	115%	1.7%	0	368	117%
South County West	KENYON 68	12.47	68F1	512	612		1.7%		497	97%	1.7%		505	99%	1.7%	0	514	100%
South County West	KENYON 68	12.47	68F2	511	612		1.7%		610	119%	1.7%		620	121%	1.7%	0	631	123%
South County West	KENYON 68	12.47	68F3	512	515		1.7%		562	110%	1.7%		572	112%	1.7%	0	582	114%
South County West	KENYON 68	12.47	68F4	514	612		1.7%		467	91%	1.7%		475	92%	1.7%	0	483	94%
South County West	KENYON 68	12.47	68F5	612	612		1.7%		414	68%	1.7%		421	69%	1.7%	0	429	70%
South County West	LANGWORTHY 86	12.47	86F1	640	648	Limiting element upgraded (transformer) 2014	1.7%		586	92%	1.7%		596	93%	1.7%	0	606	95%
South County West	WESTERLY 16	12.47	16F1	515	515	Planned retire 2014 (Hopkinton related)												
South County West	WESTERLY 16	12.47	16F2	515	515	Planned retire 2014 (Hopkinton related)												
South County West	WESTERLY 16	12.47	16F3	515	515	Planned retire 2014 (Hopkinton related)												
South County West	WESTERLY 16	12.47	16F4	645	645	Planned retire 2014 (Hopkinton related)												
Tiverton	TIVERTON	12.47	33F1	478	515		0.1%		332	69%	0.1%		332	69%	0.1%		332	70%
Tiverton	TIVERTON	12.47	33F2	456	515		0.1%		367	80%	0.1%		367	81%	0.1%		368	81%
Tiverton	TIVERTON	12.47	33F3	478	600		0.1%		435	91%	0.1%		435	91%	0.1%		435	91%
Tiverton	TIVERTON	12.47	33F4	456	576		0.1%		478	105%	0.1%		479	105%	0.1%		479	105%

Division 2-30 (Electric)
Reliability

Request:

Has National Grid's I&M and EHTM programs evaluated the Tunk Hill area? Based on these improvement programs, were distribution upgrades and maintenance and enhanced trimming completed?

Response:

The Tunk Hill area has not been previously evaluated by the I&M program. Given the number of customers in this area, the Tunk Hill 15F2 circuit has not qualified for the EHTM program in the past based on the EHTM model results.

The issues in the Tunk Hill Road area are predominantly overhead limb failures on bare three phase construction. This 7 mile long area has been analyzed by engineering and a reliability based project proposed. The proposal includes the reconductoring of an approximate 2-mile section with tree resistant construction and applying an aggressive overhead pruning specification, including EHTM, to the entire 7 mile section. An out-of-sequence I&M inspection may not provide additional value beyond the engineering work already performed.

Division 2-31 (Electric)
Asset Condition

Request:

During the November 29, 2014 conference, National Grid indicated that over the period of 2010 to current 2013, the Company is averaging $282,500 annually for URD cable replacements; however, the FY 2014 budget includes $2M for a URD strategy. What are the measurable goals for this program and what is the Company's justification for the large increase?

Response:

Overall the Company has improved reliability for the average customer in Rhode Island as seen in Chart 1 of the ISR Plan, through reliability programs focused on system impact, such as feeder hardening. Through the URD program, the Company is focusing on a program which addresses areas where individual customers are experiencing multiple interruptions, even though those interruptions may not have a large system impact.

The goal of the URD replacement/rehabilitation program is to address, through cable replacement or cable insulation injection, URDs where customers have seen interruptions related to three or more URD cable failures in three years. Under the program, to the Company replaces URD cable segments that have failed twice in three years to prevent customers from seeing repeat interruptions on cable segments that are failing. The measurable goal is to keep customers from receiving four or more URD cable-related interruptions in three years.

Below is a list of current project work proposed.

Customers living in the South Road Estates URD in South Kingston had six URD cable-failure related interruptions in three years. The URD was cable insulation injected in 2012. Those segments that could not be injected will be replaced in FY14 for an estimated cost of $150,000.

Carriage Heights in Lincoln had four interruptions in three years. Construction is on-going to replace submersible transformers with pad-mount transformers to facilitate cable insulation injection at this URD. Cable insulation injection is expected in FY14 at an estimated cost of $500,000. Cables that could not be injected will be replaced in FY15 at an estimated cost of $500,000.

Village Green in East Providence had three interruptions due to URD cable faults in three years. The economics of cable insulation injection on three-phase systems are not justified, so this URD is expected to be replaced in FY14 for an estimated cost of $900,000.

Prepared by or under the supervision of: Jennifer L. Grimsley

Division 2-31 (Electric), page 2

Asset Condition

Stone Gate Village in North Kingston had one interruption in three years, but was included in the FY13 program because two cable segments were out of service. The URD is being replaced in FY13, but we expect to spend $20,000 in FY14 to complete the project.

Saddle Rock Road in West Greenwich had five interruptions in three years. The URD will be partially replaced in FY14 for $120,000 to address the cables that have failed. National Grid is still scoping the follow up work for the rest of the URD in FY15.

Wethersfield Commons in Warwick had five interruptions in three years. The URD will be replaced in FY14 and FY15 for an estimated $550,000 each year.

Willowbrook in Cranston had three interruptions in three years. The URD will be cable insulation injected in FY14 for an estimated $50,000, with any segments that could not be injected replaced the same year.

Wood Estate(s) in Coventry had seven interruptions in three years. The URD will be partially replaced in FY14 for $400,000 to address the cables that have failed. National Grid is still scoping the follow-up work for the rest of the URD in FY15.

At this time more URDs have been identified than are included in the ISR budget, to allow for schedule changes given the permitting and easement issues that need to be addressed with this work. Some portion of this work may be performed in FY13 where budgeting, scheduling, permitting, and easement issues allow.

Division 2-32 (Electric)
Asset Condition

Request:

Provide the metal-clad switchgear asset ranking list and a current summary of ongoing and planned mitigation and maintenance work.

Response:

Presently, we do not have a metal-clad switchgear asset ranking list. However, it is currently under development. Metal-clad switchgear replacements are determined by the compilation of many factors, which include the test results from our inspections, the age of the metal-clad, prior failure or trouble history, and whether or not the metal-clad circuit breakers are also targeted for replacement. Three metal-clad switchgear locations have been identified for replacement over the next five years. They include Lee Street 30 Station, Daggett Avenue Station, and Crossman Street 111 Station.

The Lee Station metal clad has moisture intrusion, is 60 years of age, and the breakers are a targeted family under the Circuit Breaker Asset Replacement Program. Metal-clad switchgear manufactured during this time frame has a high rate of failure due to inferior insulation resulting in voids, partial discharge, and tracking. Additionally, gaskets older than 40 years become deteriorated and allow moisture ingress accelerating the problem. Dagget Avenue Station has experienced a failure due to water intrusion and deteriorated gaskets. The metal-clad switchgear is 60 years of age. Crossman Street 111 Station is the same vintage and manufacturer as Dagget Avenue Station.

The current ongoing and planned mitigation and maintenance work includes a visual and operational inspection of the metalclad switchgear every two months. This inspection includes verification that the bus enclosure heaters are in working condition and looks for signs of animal intrusion, corrosion, water, moisture damage, and indications of arcing or tracking. The majority of issues found in these inspections are caused by water and our mitigation plan is to immediately temporarily seal the leak with flashing cement, and to follow-up with roof resealing, gasket replacement and painting of the enclosure to mitigate the rust. This process is performed as a result of visual and operational inspection findings, trouble calls, and proactively when metal-clad circuit breakers are being replaced to protect the new assets and improve longevity of the metal-clad switchgear. A diagnostic inspection is performed on the metal-clad switchgear every ten years, which includes electrical tests on insulated current carrying members, operational tests on breakers, and a more thorough visual and operational inspection on metal-clad switchgear, circuit breakers, and cubicles.

Division 2-33 (Electric)
System Capacity and Performance

Request:

Provide the historical loading and long term loading forecast for each station that will be addressed in FY2014 for load relief. Include all stations that will be affected by load shifts or mitigation measures.

Response:

Please see responses to Electric ISR Division 2-29 and Electric ISR Division 2-34. The long -term loading for all feeders in Rhode Island are shown in Attachment Elec ISR-DIV 2-29(a) and Attachment Elec ISR-DIV 2-29(b). The response in Electric ISR Division 2-34 explains which feeders and substations directly correspond to the load relief projects. For historic loading, only the 2011 peak is included. The 2012 actual peak loads are not yet available, so the 2012 loads shown are forecast loads. Years prior to 2011 are not included as feeder configurations change over time, and the loads are not adjusted for feeder reconfigurations.

System Capacity and Performance

Request:

For each station to be addressed by load relief expenditures, provide a detailed project justification that includes: (1) Historical loading, (2) Forecast load, (3) Circuit-by-Circuit load flows, (4) Maximum station voltage drop, (5) Summary of capacity, voltage drop, or reliability issues experienced, and (6) Alternate projects considered.

Response:

The tables below show summaries for the Load Relief projects in the FY2014 proposed plan, including requested items (5) and (6). A project may include subprojects with proposed spend in later years. Those sub-projects with FY2014 spend are shown by a yellow highlight. The 'Substation(s) / Feeder(s) Impacted' row shows those feeders and substation transformers with load transferred from or to for the overall project. These transfers may occur over one or more years and the transfer details are provided in the Attachment Elec ISR-DIV 2-29(a) and Attachment Elec ISR-DIV 2-29(b), along with the available load information relative to items (1), (2) and (3) above. Maximum station voltage drop (4) for each feeder is not available. A green highlight shows stations identified with flood risk and are to be retired. Although 'Do Nothing' alternatives were considered for the projects below, this alternative is not specifically listed. In all cases, the 'Do Nothing' alternative was dismissed as the normal and contingency issues would remain unaddressed.

Chase Hill (Hopkinton) Substation

Distribution Related Project Number(s):	C24176 03304 Hopkinton Substation (Dist Sub) C24175 03303 Hopkinton Substation (Dist Line) C33050 03508 New Hopkinton RI Substation C34102 03714 Retire Ashaway 43 Substation C36233 11971 Retire Hope Valley (D Sub) C36234 11972 Retire Hope Valley (D Line) C36214 11973 Hopkinton Phase 2 (D Sub) C36229 11974 Hopkinton Phase 2 (D Line) C36527 11975 Retire Westerly (D Sub)
Substation(s) / Feeder(s) Impacted:	Chase Hill (Hopkinton) – F1, F2, F3, F4, F5, F6, F7 Ashaway 43 - 43F1 Westerly 16 – 16F1, 16F2, 16F3, 16F4 Hope Valley – 41F1
Voltage(s):	12.47kV
Geographic Area Served:	Hopkinton, Westerly

System Capacity and Performance

Summary of Issues:

Facility loading (normal and contingency) and outage exposure concerns were originally identified in 2007 and reconfirmed in 2009 and 2011. These concerns include one transformer and four feeders projected to be loaded above their summer normal rating. (Three feeders identified in 2011 analysis.) In addition, to normal loading concerns, three transformers and two distribution supply lines are projected to exceed their summer emergency ratings.

The feeders originating at the Westerly Substation belong to "Phasing Group 3" while the majority of 12.47kV feeders in Rhode Island below to "Phasing Group 2". This means, during normal system maintenance or upon contingency, other area feeders cannot be used to reroute power to Westerly customers.

During the effort to find a suitable Hopkinton Substation site, a severe rainstorm on March 30, 2010 created a flood event in the adjacent town resulting in the failure of the Westerly Substation in R.I. The area east of the Pawcatuck River experienced record floods, submerging the substation in 6.5 feet of water.

Alternatives:

Load Relief:
Reinforcement and expansion of the existing 34.5kV distribution supply and 12.47kV distribution system. This would require replacement of both Wood River transformers, replacement of both Westerly supply transformers, development of the Westerly 16F4, F5, and F6 feeders, and upgrades to the Wood River supply lines. This plan was estimated to cost a total $11 million (2006 dollars)

Flood Risk Mitigation:
This alternative recommends the rebuild of Westerly substation on company owned property outside of the flood plain area. The Westerly substation rebuild would require delta/zigzag transformers to correct area phasing. This alternative includes the upgrade of Langworthy substation to add additional capacity and correct area phasing (Langworthy upgrade is common to all plans).
This option would require procurement, permitting, and licensing of new property further from the Pawcatuck River. The conceptual estimate for this option is $14.000M, and does not include the cost of land or permitting of a new site and still requires the approved partial construction of a new substation in Hopkinton, RI.

System Capacity and Performance

New London Ave (West Warwick) Substation

Distribution Related Project Number(s):	C2892003419 New Substation West Warwick C2892104414 Install 4 dist. Fdrs West Warwick
Substation(s) / Feeder(s) Impacted:	New London Ave (West Warwick) – 150F1, 150F2, 150F3, 150F4 Anthony - 64F1, 64F2 Arctic - 49J1, 49J2, 49J4 Division St – 61F3 Hope – 15F1, 15F2 Hopkins Hill – 63F2, 63F5 Kent County – 22F3, 22F4 Natick – 29F1
Voltage(s):	12.47kV
Geographic Area Served:	West Warwick, Conventry, West Greenwich
Summary of Issues:	Six feeders are projected at or over 100% of rating in 2011 with another three feeders projected at 99% of rating. (2011 update – 5 feeders greater than 100% and 4 feeders above 95%)
Alternatives:	There are several build alternatives that were considered. One alternative involved the expansion of existing 115/12.47 kV substations at West Cranston and Kent County together with expansion of the 23 and 35 kV supply systems at Drumrock and Kent County substations. The supply lines would have to be rebuilt for a larger capacity to accommodate two new modular stations in West Warwick and Coventry. It will be necessary to procure sites with the appropriate zoning for each station. The distribution system will be modified to accommodate the new stations. The estimated distribution cost of this option is $11,300,000. There will be an additional $3,800,000 in associated transmission costs. This option exceeded the cost of the preferred option; there are no additional benefits; and the uncertainty of finding appropriate lots make this option unattractive at this time. A second alternative considered was the development of a new 115/12.47 kV metal clad station on a site in Cranston near Phenix Avenue. The transmission costs are similar to the preferred plan however the distribution costs to extend feeders from this site to relieve the overloaded feeders and supply lines would be significantly more due to the limited routes available and the distance from the overloaded facilities. The details of this option were not fully developed as the estimated distribution costs far exceeded those of the preferred alternative which was near the stations with loading issues. This option is also not recommended at this time.

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Johnston Substation Expansion

Distribution Related Project Number(s):	C33535 04443 Johnston Sub 12.47 kV Expansion C28884 04415 Install Johnston 18F10 Feeder C34002 03435 Johnston Sub 12kV Expansion Getaways C36072 04442 Johnston #18 Substation Expansion
Substation(s) / Feeder(s) Impacted:	Johnston – 18F1, 18F3, 18F5, 18F7, 18F8, 18F10 Manton – 69F1 West Cranston – 21F1, 21F4
Voltage(s):	12.47kV
Geographic Area Served:	Johnston
Summary of Issues:	Two feeders are projected to be in excess of 100% of their normal summer rating by 2014 and one feeder is projected to be equal to or in excess of 94% of its rating. These projections and the need for this project were initially based on the 2009 load forecast. The need was re-evaluated using the 2011 load and the need to upgrade transformer No. 3 was verified. Due to the heavy loading of the feeders in this area and the limitations of the feeders in the old yard, switching is not a viable option to reduce loading on the feeders that are above their normal rating. Also new capacity is required in the area. It is proposed that a new feeder be developed out of Johnston Substation, to be completed by summer 2014. The addition of substation capacitors for transformer reactive loss compensation is also recommended at this time. Along with the expansion of the new 12.47 kV switchgear it is recommended that the 40 MVA T3 transformer be replaced with a 55 MVA unit in order to satisfy the planning design criteria for a contingency for loss of a transformer. The worst contingency is the loss of T4 which could lead to a 266 MWHr outage in 2013.
Alternatives:	Alternative 1 - Replace transformer No. 3 with 55 MVA unit, transfer all 12.47kV load to transformers No. 3 and No. 4, remove 12.47kV winding from transformer No. 1 This option includes building five 12.47kV feeders. Four of the feeders will be transferred from the old switchyard, and one feeder will be brand new. The old 12.47kV switchyard will be retired, and all the equipment (including the 6-VIR type circuit reclosers) will be removed. Two substation capacitor banks will also have to be installed. This option will increase the capacity of the new 12.47kV switchgear and will

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make it possible to remove the old 12.47kV equipment from the remaining 3-winding transformer, including the 6-VIR type circuit reclosers which are now obsolete.

(Total Cost: $7.35M)

Alternative 2 - Replace transformer No. 3 with 55 MVA unit, but continue using transformer No. 1 in its current configuration

This option involves building only one additional 12.47kV feeder at the new switchyard which is necessary to relieve the overloaded 18F1 and 18F7 feeders. Transformer No. 1 will continue to serve the 12kV load it is currently serving.

The 6-VIR type circuit reclosers in the old 12kV switchyard will need to be replaced due to obsolescence. Replacements are presently being budgeted and scheduled under the Circuit Breaker and Recloser Strategy.

Other upgrades will also be necessary in the old yard to remove loading limitations in the bays during contingencies. This will permit full utilization of the available feeder capacity in the old yard. The 12.47kV connection to the new yard will have to be made permanent or the No. 2 transformer will have to be replaced with another three winding transformer. A separate 115/12.47kV transformer to supply the No. 2 12.47kV bus is not feasible due to space limitations in the yard.

Delay in eliminating the old yard will make eventual elimination of the yard more difficult and costly. This is due to the old yard having to be removed prior to expanding the new yard and a larger station load having to be maintained during construction. This will require construction to be carried out in multiple phases in periods of light load condition, adding to the complexity, risk to load and mobilizing and demobilizing costs each time. The recommended plan can be executed in a staged sequence that minimizes reliability risk and project cost.

The installation of capacitors for transformer reactive compensation would either have to be delayed or performed in an unconventional manner since installing capacitors in their typical location on the bus ends would hinder future expansion of the new 12.47kV yard to accommodate additional feeders.

Although this option may defer equipment costs, it could lead to higher construction costs. It also increases reliability risk as obsolete equipment is kept in service.

(Total Cost: $8.2M – this includes the deferred costs)

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Newport Substation

Distribution Related Project Number(s):	C15158 03529 Newport Substation (D-Sub) CD0649 17046 Gate 2 Substation (D-Sub) C28628 03528 NEWPORT Load Relief - Phase 2 C24159 03531 Newport 69kV Line 63 (D-Line)
Substation(s) / Feeder(s) Impacted:	Newport – W1, W2, W3, W4. W5 Bailey Brook – 19J14, 19J16, 19J2 Gate II – 45J1, 45J2 Jepson – 37J2, 37J4, 37W41, 37W42, 37W43 Kingston – 131J12, 131J2, 131J4, 131J6 North Aquidneck – 21J2, 21J6 South Aquidneck – 122J4, 122J6 Vernon – 23J12, 23J2, 23J4, 23J6 West Howard – 151J18, 154J8
Voltage(s):	13.8kV
Geographic Area Served:	Newport, Middletown
Summary of Issues:	The southern portion of Aquidneck Island is supplied by a highly utilized supply and distribution system. This 23kV supply system and 4.16kV distribution system has limited capacity to supply load growth and new spot loads. It is becoming increasingly challenging to supply large spot loads in southern Middletown and in the City of Newport. The Jepson 13.8kV system has been utilized to provide relief to the 23kV supply system, the 4.16kV distribution system, and to supply large spot loads. However, this 13.8kV system has been extended to its limits. For loss of the Jepson 13.8kV system, the 13.8kV supplied load in the City of Newport will be out until Jepson is placed back in service. In 2011, for loss of the Dexter 115/13.8kV transformer on peak up to 13MW of load on Aquidneck Island (primarily in Portsmouth) would remain un-served until the transformer is replaced or a mobile is installed. This results in an exposure of approximately 350MWh. In 2011, for loss of the Jepson 69/13.8kV transformer on peak up to 17MW of load on Aquidneck Island (primarily Middletown and the City of Newport) would remain un-served until the transformer is replaced or a mobile is installed. This results in an exposure of approximately 460MWh. In 2011, for loss of the 69kV line section between Jepson and the Navy substation on peak up to 18MW of load would remain un-served. Either Navy load would be un-served or a large portion of the City of Newport load would be un-served. This results in an exposure of approximately 500MWh.

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Equipment concerns exist at the Jepson 4.16kV substation. A condition evaluation of these assets was completed in 2005 by O&M services. This evaluation identified concerns with the 4.16kV station regulators and the 37J4 recloser. Regulators do not meet clearance requirements and are located before the breakers. This configuration results in a regulator failure causing a two feeder outage. In addition, both feeders need to be removed from service to perform any regulator maintenance making operating the 4.16kV station challenging. O&M services recommends either the station equipment be reconfigured or the station be retired.

Alternatives:

Alternative 1 ($56.000M): This plan proposes similar investments to the recommended plan and offers similar benefits. The main difference being this alternative assumes the second 69kV supply line into Newport would be installed underground. The estimated cost of this alternative is $56M due to the increased cost to build the underground 69kV line. This plan maintains the overhead facilities installed on both sides of West Main Road in Middletown and would not reduce the congestion that currently exists in the area. This plan is not recommended due to the incremental cost to install an underground transmission line and because it offers no reliability improvement over the recommended plan.

Alternative 2 ($42.000M): This plan recommends construction of two new substations. The first is a new 69/13.8kV station in the City of Newport consisting of a single 40MVA transformer supplying four (4) feeders sourced from the existing 69kV line. The second is a new 69/13.8kV station in the existing Jepson substation yard consisting of a single 40MVA transformer supplying four (4) feeders and sourced from the existing 69kV system. This plan recommends upgrades to the 37K33 supply line from Jepson to Gate 2 substations to increase back-up capacity for loss of the overhead 69kV line to the US Navy, Gate 2 substation, or the new substation in Newport. This plan is not recommended because:

- The estimated cost of this alternative is $42.000M, or approximately equivalent in cost to the recommended plan. However this plan is less reliable, more sensitive to load growth, and less flexible.
- Plan adds approximately 25MW of additional load to the radial 69kV supply line (Line 63). The load on this radial line would increase to 81MW. For loss of Line 63 all new station and Navy load would be out (approximately 46MW). The new station load needs to be manually picked up from Jepson feeders. This would require substantial reinforcements and expansion of the existing 13.8kV distribution system. These reinforcements would occur on highly congested roads and would add to the congestion of the area. Navy load would have to be manually picked up through the 23kV supply line into Gate 2.
- Plan requires reinforcement and expansion of triple circuited assets installed on highly congested roads. Reinforcements would be required on both sub-transmission and distribution assets. Permitting this type of

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construction could be challenging due to the high area congestion already existing. Plan would not eliminate the overhead assets installed on both sides of West Main Road in Middletown. Rather it would require reinforcement and upgrades to these assets.

- Plan assumes that sufficient upgrades can be performed to establish strong ties between Jepson substation and the new substation in Newport to address the load at risk for loss of the supply line to the new station or loss of the station transformer. If these upgrades are not possible, there could be enough un-served load at the new station to initially be non-compliant with the Distribution Planning Criteria.
- Plan assumes load growth will occur uniformly on Aquidneck Island. This may not be the case since the City of Newport has plans to open up land for development and the Navy is still considering a base expansion. If higher than forecasted load growth occurs in Newport or the Navy expands, it will be increasingly challenging to back-up this load from Jepson substation. This will result in Newport load being out until the Newport substation is placed back in-service and Navy load being out until repairs are made to the 69kV supply line. This will accelerate the need to extend the second 69kV line into Newport and the expansion of Newport substation.

Alternative 3 ($31.000M): This plan recommends construction of a single modular feeder in the City of Newport and a new 69/13.8kV station in the existing Jepson substation yard consisting of a single 40MVA transformer supplying four (4) feeders. This Plan recommends upgrades to the 37K33 supply line from Jepson to Gate 2 substations to increase back-up capacity for loss of the overhead 69kV line to the US Navy and Gate 2 substation. This plan is not recommended because it does not address the long-term needs of the area or the asset concerns at Vernon substation and the environmental concerns at Bailey Brook substation:

- Plan provides little new capacity in the City of Newport, where capacity is needed the most. A modular feeder only adds 12.6MW of new capacity in the heart of the Newport 4.16kV system. Initial loading would be 9.2MW leaving only 3.4MW of capacity to supply future load growth in the City.
- Plan is extremely sensitive to load growth. The City of Newport is pursuing the development of the area in the vicinity of the proposed modular feeder as shown on Figure 15. If load growth exceeds forecasted values, a major new investment would be required in the City of Newport. This investment would likely be a new substation in the City of Newport and the second 69kV supply line.
- Plan does not introduce sufficient capacity to retire Bailey Brook substation. This station is located within local wetlands and adjacent to a running brook that is a source of the water supply for the island.
- Plan does not introduce sufficient capacity to retire Vernon substation. The Vernon metal-clad switchgear was installed in 1949 along

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with the TR231 transformer. The station breakers have been identified for asset replacement along with the TR231 transformer. The recommended plan eliminates the need for asset replacement at this station by retiring these assets.

- Plan adds an additional 12.6MW of load to an already highly utilized sub-transmission system which would have a negative impact on the areas reliability.
- Plan requires reinforcement and expansion of triple circuited assets installed on highly congested roads. Reinforcements would be required on both sub-transmission and distribution assets. Permitting and construction may be challenging due to the high congestion already existing. Plan would not eliminate the overhead assets installed on both sides of West Main Road in Middletown. Rather it would require reinforcement and upgrades to these assets.
- Plan assumes that sufficient upgrades can be performed to establish strong ties between Jepson substation and the new modular feeder to address the load at risk for loss of the modular feeder. If higher than forecasted load growth occurs in Newport, it will be increasingly challenging to back-up this load from Jepson substation. This will result in Newport load being out until the modular feeder is placed back in-service.
- Plan assumes load growth occurs uniformly on Aquidneck Island. This may not be the case since the City of Newport has plans to open up land for development and the Navy is still considering a base expansion. If load growth occurs in Newport or the Navy expands, it will be challenging to supply Newport load and to back-up Navy load. This would accelerate the need to extend the second 69kV line into Newport and the construction of Newport substation.
- The cost of this plan is estimated at $31.000M. However, the plan only defers the need for a major investment in the City of Newport. The plan would defer but not eliminate the need to eventually install the second 69kV line into the City of Newport and construct a new substation in Newport to supply load growth on the southern part of Aquidneck Island. This plan offers the least reliability improvements and is the most sensitive to load growth.

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Kilvert St Second Transformer
Kilvert St Two New Feeders

Distribution Related Project Number(s):	Second Transformer C36522 09312 Kilvert St Install TB#2 (D-Sub) Two New Feeders C36515 09313 Kilvert St Substation (D-Sub) C36516 09303 Kilvert St Substation (D-Line)
Substation(s) / Feeder(s) Impacted:	Kilvert St – 87F2, 87F3, 87F5, 87F6 Apponaug – 3F1, 3F2 Drumrock – 14F1, 14F2, 14F3, 14F4 Lincoln Ave – 72F1, 72F4, 72F5, 72F6 Warwick – 52F2, 52F3
Voltage(s):	12.47kV
Geographic Area Served:	Warwick, Cranston
Summary of Issues:	Second Transformer: By 2015 peak load at Kilvert Street is projected at 32MW. This load, combined with decreased feeder tie capacity, would result in approximately 23MW of un-served load for loss of the single Kilvert Street transformer until a spare or mobile transformer is installed. This results in an exposure of 567MWh. Two New Feeders: Loading on a number of feeders in this area is projected to exceed summer normal ratings within the next five years. Load transfers have been used in the past to defer the need for infrastructure investment, but further transfers are no longer possible. New capacity is required to address these projected overloads. In 2015, loading on the Warwick T1 transformer is projected at 113% of its Summer Normal (SN) rating. In 2017, loading on the Warwick T4 transformer is projected at 101% of its SN rating. Relief of these transformers is not possible without adding new capacity. In 2020, loading on the 2222 sub-transmission line is projected at 100% of Summer Normal (SN) rating. In 2023, loading on the 2262 sub-transmission line is projected at 100% of SN rating. Contingency loading on sub-transmission lines projected to be loaded above summer emergency ratings is shown on the table below. Block transfers are utilized to prevent line overloads. These block transfers have a negative

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impact on reliability and make operating this system costly and challenging since block transfers have to be made manually due to lack of remote control capabilities.

Alternatives:

Second Transformer Alternatives:
Alternative 1 ($8.0M): This plan recommends development of a new 115/12.47 kV substation adjacent to the transmission right-of-way on a new site near the intersection of East Avenue and Greenwich Avenue in the city of Warwick. This substation would be supplied from the adjacent 115kV transmission lines. Initially, the substation would be equipped with a single 24/32/40 MVA transformer and two feeders. Land would have to be acquired to house this proposed substation. The Investment Grade Estimate of this plan is $8.0M. This alternative is not recommended because of the higher cost, the need to find a suitable parcel of land, and the potential permitting challenges associated with building on a new site.

Alternative 2 ($8.2M): This plan recommends development of a new 23/12.47 kV modular substation with two feeders at Hillsgrove, a former 4.16kV substation site on Jefferson Boulevard in the city of Warwick just north of T. F. Green airport. This plan requires a major expenditure to reinforce the 23kV supply system to provide capacity to supply the proposed Hillsgrove substation. The Investment Grade Estimate of this plan is $8.2M. This plan is not recommended because it offers no advantages over the recommended plan or Alternative 1.

Two New Feeders Alternatives:
Alternative 1 ($10M): This plan recommends development of a new 115/12.47 kV substation adjacent to the transmission right-of-way on a new site near the intersection of East Avenue and Greenwich Avenue in the city of Warwick. This substation would be supplied from the adjacent 115kV transmission lines. Initially, the substation would be equipped with a single 24/32/40 MVA transformer and two feeders. Land would have to be acquired to site this proposed substation avoiding to the furthest extent possible wetlands along the Pawtuxet River. The Investment Grade Estimate of this plan is $10M. Much of the distribution line additions associated with the recommended option would be required under this plan. This alternative is not recommended because of the higher cost, the need to find a suitable parcel of land, and the potential permitting and environmental challenges associated with building on a new site.

Alternative 2 ($16M): This plan would require significant substation and

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sub-transmission work. Substation work would include the installation of a new modular feeder at Warwick substation, the upgrade of the three existing Warwick substation feeders, and the addition of EMS to the station. Sub-transmission improvements would include the upgrade of the sub-transmission system between Drumrock and Warwick substations. Specific work would include upgrading approximately 12-miles of limiting conductors to 795 ACSR along congested residential city streets. The Investment Grade Estimate for this plan is $16M. This plan is not recommended because of the comparatively higher cost to the recommended plan.

Clarke St Substation Expansion

Distribution Related Project Number(s):	11664 CLARKE 65J12 Feeder Upgrade (D-Sub) 11665 CLARKE St Feeder Upgrades (D-Line)
Substation(s) / Feeder(s) Impacted:	Clarke St – 65J12, 65J2
Voltage(s):	4.16kV
Geographic Area Served:	Jamestown
Summary of Issues:	Clarke Street substation feeders, which supply the southern half of Jamestown, are in need of relief. The distribution system on the island has been maximized over the years to off-load Clarke Street substation and defer a major investment. To provide further relief new distribution capacity is required.
Alternatives:	Alternative 1: This Plan would recommend installing a modular feeder in southern Jamestown. The Company would need to purchase land to house this modular feeder. The estimated cost of this Plan is $2.9M of which $1M is assumed for the cost of land. Due to limited land availability and high real estate costs, a suitable parcel of land in southern Jamestown to house this modular feeder could be difficult to located and the cost could much higher than the assumed $1M. This plan is substantially more expensive and higher risk than the preferred plan and therefore is not recommended.

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Highland Drive Substation

Distribution Related Project Number(s):	CD0972 11915 New Highland Drive Substation - DSub CD0978 11916 New Highland Drive Substation - DLine
Substation(s) / Feeder(s) Impacted:	Highland Drive – F1, F2, F3, F4, F5, F6
Voltage(s):	13.8kV
Geographic Area Served:	Cumberland, Woonsocket
Summary of Issues:	The primary driver for this project is load relief to address normal and contingency loading issues in the Woonsocket/Cumberland, RI area. Considering the new commercial load growth and requests for second feeder service, three area feeders will be above summer normal limits by 2014. In addition the two major substations in this area, Riverside#108 and Staples#112, have contingency load at risk of 290 MWhrs and 593 MWhrs respectively, both exceeding the distribution planning criteria. The following option analysis is a configuration comparison. A location comparison was determined to provide no viable alternatives as the alternatives below include National Grid owned land located at the load center and immediately adjacent to transmission rights-of ways. Other locations would require greater distribution line work and be exposed to increased risks associated with land acquisition and/or transmission sighting.
Alternatives:	Alternative 1($14.694M): This alternative is to install a new substation with two (2) 55MVA transformers and 6-feeder low-profile substation with breaker-and-a-half configuration. The station will be built to accommodate 2 future feeders for a fully built 8-feeder substation. This option requires longer preliminary engineering, final engineering, procurement and construction efforts increasing the risk of meeting the customer in-service date and a marginal initial cost savings due to installation of 6 feeders instead of 8 feeders.

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Kent County Substation Expansion

Distribution Related Project Number(s):	15721 Kent County 2nd Transformer (D-Sub) 19203 Kent County 2nd Transformer (D-Line)
Substation(s) / Feeder(s) Impacted:	Kent County – 22F4, 22F6 Hunt River – 40F1
Voltage(s):	12.47kV
Geographic Area Served:	Warwick, West Warwick, East Greenwich
Summary of Issues:	Load at risk in the cities of Warwick and West Warwick for loss of the single Kent County substation transformer. An outage on the Kent County transformer results in the loss of 42MW of load. Of this load, approximately 15MW can be transferred to other area stations through feeder ties leaving 27MW of load (approximately 6,000 customers) un-served until a spare or mobile transformer is installed at Kent County. This results in an exposure of 696MWh. Flooding in March 2010 resulted in equipment damage at Hunt River substation. The station is located within a wellhead protection area and within the flood plain. In addition to the flooding and environmental risks, the station has a number of asset condition concerns that should be addressed. The recommended plan is to abandon this site and supply Hunt River substation load from a new Kent County substation feeder. The primary alternative analysis evaluates options to address the two project drivers: contingency load at risk and flood risk mitigation. The recommended plan and Alternative 1 include similar flood risk distribution line solutions at investment grade costs of \$0.70M. It should be noted an alternative analysis considering only the flood risk would include a Hunt River substation replacement option at an investment grade cost of \$0.95M.
Alternatives:	Alternative 1 (\$6.5M): This plan would recommend expansion of the proposed West Warwick substation. The plan includes the installation of the second half of the station consisting of the second 115/13.2kV, 24/32/40 MVA transformer and metal-clad switchgear with one new feeder position. This alternative is not recommended because it offers little benefit over the recommended plan and it is \$2.1M higher in cost.

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Warwick Substation Feeder Upgrade

Distribution Related Project Number(s):	18538 Warwick Sub 52F3 Feeder Upgrade
Substation(s) / Feeder(s) Impacted:	Warwick – 52F3
Voltage(s):	12.47kV
Geographic Area Served:	Warwick
Summary of Issues:	In 2013, the Warwick 52F3 feeder is projected at 107% of its summer normal rating. The feeder is limited to 406Amps by 3-250kVA voltage regulators. Load transfers to the other two feeders in the area, 52F1 and 52F2, are not recommended because it would overload the single 9.375MVA transformer supplying both feeders.
Alternatives:	No economical alternative exists to this recommendation. Load transfers to the other two feeders in the area, 52F1 and 52F2, are not recommended because it would overload the single 9.375MVA transformer supplying both feeders.

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Clarkson Substation New Feeder

Distribution Related Project Number(s):	C36397 04403 Clarkson - new 13F10 feeder (line)
Substation(s) / Feeder(s) Impacted:	Clarkson – 13F10, 13F2, 13F3 Johnston – 18F5
Voltage(s):	12.47kV
Geographic Area Served:	Providence

Summary of Issues: 13F2, 13F3, 13F4 feeders projected to be at or near their SN ratings in 2016.

Alternatives: No economical alternative exists to this recommendation.

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Woonsocket Feeder Ties

Distribution Related Project Number(s):	18578 Woonskt-Add new feeder to Mass load 18577 Woonskt Sub-Add new fdr pos for Mass load
Substation(s) / Feeder(s) Impacted:	Woonsocket – 26W41 Riverside – 108W53, 108W62
Voltage(s):	13.8kV
Geographic Area Served:	Woonsocket
Summary of Issues:	Massachusetts feeder 321W9 at 100% SN rating by 2015. Avoid rebuild of 2+ miles of 321W9 thru swamps and across 2 river crossings.
Alternatives:	No economical alternative exists to this recommendation. Avoid rebuild of 2+ miles of 321W9 thru swamps and across 2 river crossings.

Prepared by or under the supervision of: Jennifer L. Grimsley

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Wakefield 17F1 Feeder Upgrade

Distribution Related Project Number(s):	18350 Wakefield 17F1 Feeder Upgrades
Substation(s) / Feeder(s) Impacted:	Wakefield – 17F1
Voltage(s):	12.47kV
Geographic Area Served:	Wakefield
Summary of Issues:	In 2014 the Wakefield 17F1 feeder is projected to be loaded to 103% of summer normal rating. The field ties to this feeder do not have capacity to provide the needed relief to reduce loading on this feeder below summer normal rating.
Alternatives:	No economical alternative exists to this recommendation. The field ties to this feeder do not have capacity to provide the needed relief to reduce loading on this feeder below summer normal rating.